December 1993 Issue #29

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Radio Fun

$2.00

"The beginner's guide to the exciting world of amateur radio."

in this issue

features

review

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departments

Government Launches PCS Era

The Federal Communications Commission has allocated 160 MHz for the new PCS (Personal Communications Service) in the 2 GHz band. The decision is expected to spark intense competition to deliver wireless services.

The FCC plans to use auctions to award PCS licenses. Local telephone companies are seen as the big losers in the decision. The new PCS service will compete with the cellular telephone industry and will carry data, video, and voice transmissions.

What this will mean to the future of ham radio is anyone's guess. Some are already speculating that PCS will be to the 1990s what the cell-phone was to the 1980s. One lightweight portable communicator could soon serve you at home, at work, and in your car. Your phone number would follow you wherever you go. The system can deliver reliable communications to portable phones, FAX machines, and pocket computers.

The Clinton Administration hopes to generate as much as $10 billion for the treasury from frequency auctions. By the year 2010, 60 million subscribers could generate up to $40 billion in revenue. *TNX Electronic Engineering Times, Issue 765, Sept. 27, 1993, and W5YI Report, Issue 19, October 1, 1993.*

Ham Nobel Prize Winner

The winner of the 1993 Nobel Prize for physics, Princeton University's Dr. Joseph H. Taylor K1JT, attributes his success in science to his early involvement in amateur radio. Taylor shared this year's prestigious award with his former student and now Princeton colleague, Dr. Russell A. Hulse.

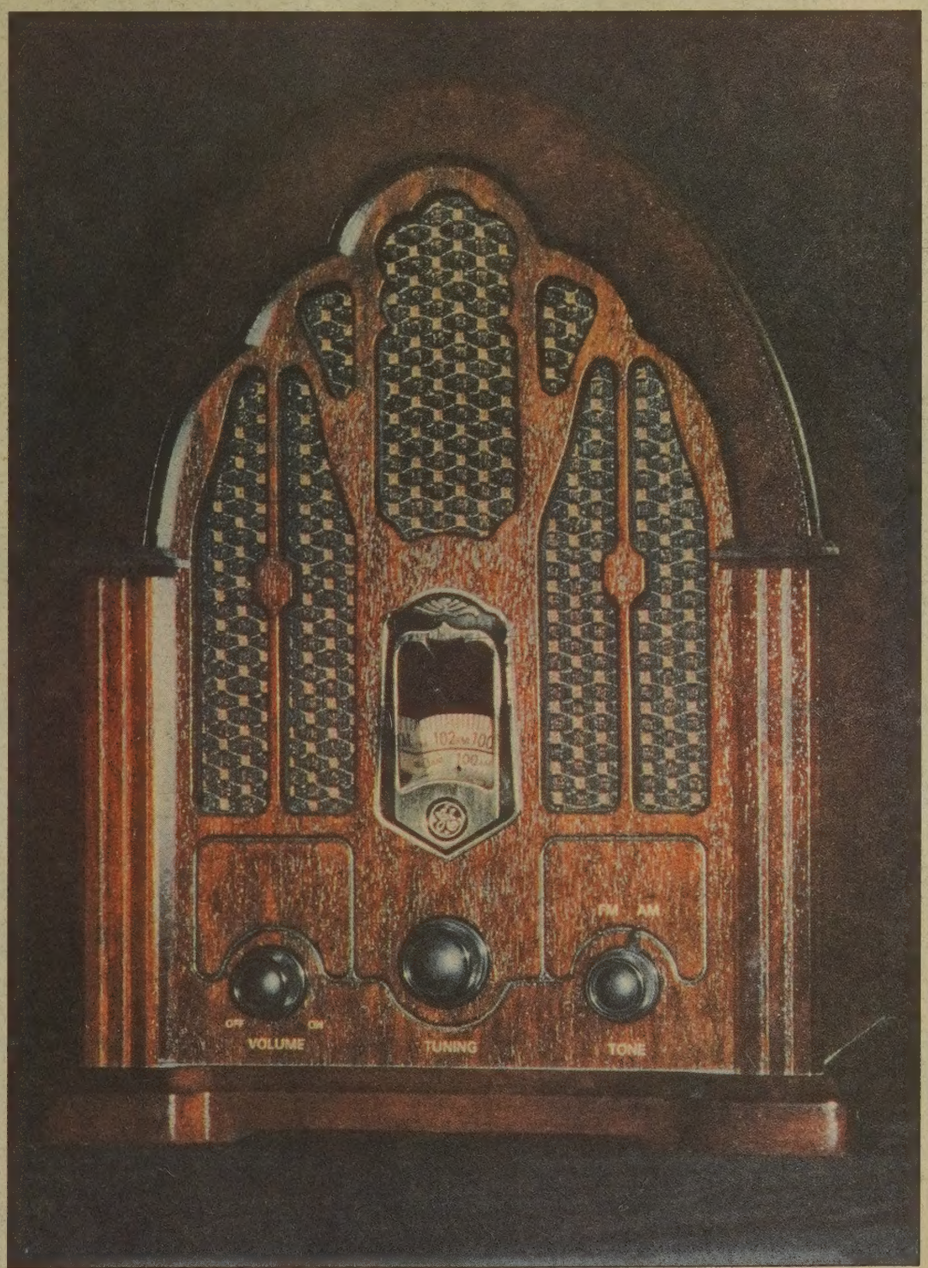
Upon learning of his winning the prize, Dr. Taylor told reporters that he developed his scientific skills as a ham during his years at Moorestown Friends Academy in New Jersey. He later earned a Bachelors degree from Haverford College and a Doctorate in Astronomy from Harvard University. The Nobel Committee honored Taylor and Hulse for their study of the gigantic gravitational forces exerted by pulsars. *TNX ARRL.*

Mega-Micro QSO

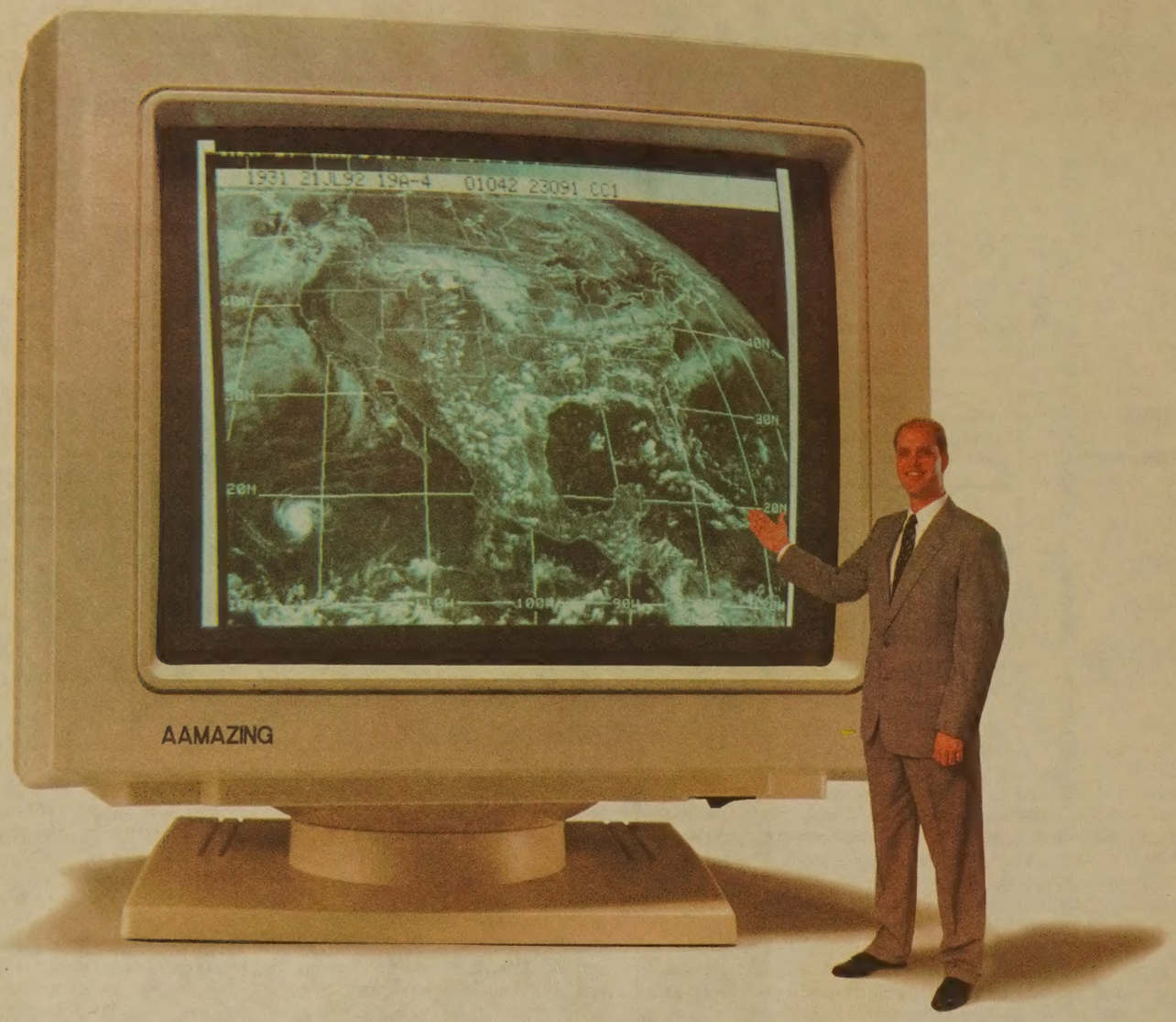
Paul Lieb KH6HME, and Chip Angle N6CA recently set a new 902 MHz terrestrial distance record of 2,469 miles (3973 km). The CW contact, with signals just out of the noise, came at 0136 UTC on August 23.

For the next four hours, the pair tried unsuccessfully to make contact on 2304 MHz. A frequency near 144 MHz was used for liaison. The equipment used for this historic achievement was designed by N6CA. *TNX Westlink Report, No. 658, September 30, 1993.*

Radio Roots: Hear What It Was Like



Back in the 1930s, Americans gathered in their living rooms and parlors to listen to the world through radio. Pictured above is a replica of a vintage 1932 General Electric Model J100 Cathedral Radio. This reproduction may look authentic, but it gives itself away by the letters "FM" over the right-hand knob. (FM broadcasting appeared on the scene a little later.) Learn more about your radio roots. Turn to our exclusive two-part series: "A Few Memories of Radio" on page 4. (Photo by WA1RZW.)



Why Wait For The Weather?

Hate to wait for the weather? AEA FAX II is the answer.

This IBM-compatible software receives HF SSB transmissions and displays satellite maps and WEFAX images in 16 levels of gray, giving you highly detailed pictures like the one you see here.

In addition to gray-scale images, you'll be able to receive and decode Morse Code, RTTY, and NAVTEX transmissions. And tuning the signal is easy—AEA FAX II has an on-screen tuning indicator to help you keep the signals coming in clearly.

Features, like the ability to export your fax pictures to PCX and GIF files and a logging function to keep track of your favorite stations, make AEA FAX II easy to use right out of the box! Simply plug in the demodulator (shown here), install the software, and you're ready to receive highly detailed images.

Don't wait another minute. Call AEA's Literature Request line at (800) 432-8873 for more information, or contact your favorite ham radio equipment dealer. If even another minute is too long to wait, call us direct at (206) 774-5554.

Requires PC-compatible XT, AT, or better and a general coverage HF SSB receiver. VGA monitor required for gray-scale fax display.

AEA

Connect with us

QLF

by Wayne Green W2NSD/1

My UHF Adventure.

A few years ago Chuck WA1KPS, a skiing and scuba diving buddy of mine, got interested in the 10 GHz band. Interested enough to put together a pair of small transceivers. Then what he needed was someone to talk to on this new band. This ham band, which runs from 10.0 to 10.5 GHz, is right next to the police radar 10.525 channel and provides us with 500 MHz of completely unused frequencies.

Let's see, if we were to set up one UHF channel via satellite on each 10 kHz, we'd have room for 50,000 of us to talk at once without any interference. Make that 100,000 if we're talking to someone other than ourselves. We're talking about a very big band. And being up in choice satellite frequencies, these are exceedingly ideal frequencies for commercial use.

Chuck wanted to see how the transceivers would do over the 50-mile path between his place in Massachusetts and mine in New Hampshire. So one night he drove up a hill near his house and I drove to the top of 2,500-foot Pack Monadnock mountain, about three miles away. I climbed the stairs of the fire lookout tower, just for a little extra height. We coordinated on 2m, aiming the little waveguide horn antennas at each other using maps and compasses. Then we started calling and tuning. It took about 15 minutes before we connected. We found it tricky getting both our antennas aimed exactly right, and at the same time getting on the same frequency. Once we hit it the signals were solid and the sound quality superb.

Naturally we picked a cold night, so my fingers were freezing as I aimed the box with one hand and tuned with the other, while holding a flashlight under my arm so I could see what I was doing. I didn't know at the time that this was just the first of a long series of bitter nights I would be spending atop the mountain, fighting the wind and cold.

The signals were so strong over the 50-mile path than Chuck was anxious to see if we could make contact between my mountain and Mount Agamenicus, in southern Maine. So a few days later Chuck drove to Maine and I climbed back up my fire tower. Again we had to hunt for the right antenna bearings and tune to exactly the right frequency. But we made it! Hmm, now how about Vermont? Sure, let's give it a try.

A couple weeks later Chuck drove to the top of Vermont's Mt. Ascutney. Again I fought off frostbite, blowing on my fingers and tuning. And again we were able to make a good solid contact. That was three contacts, and all over 50 miles. Considering we were using a 10th watt, this seemed remarkable. So let's try for more distance.

The map said Mt. Washington was 106 miles away; let's try that. Chuck dutifully drove to northern New Hampshire and up the auto road to the 6,200' top. We connected on 2m all OK, but would we be able to make it on 10 GHz? I didn't have a good shot, so we weren't sure. I had to aim my signal between two mountains to make it, according to our maps. It was really cold the day we tried this one. To hell with the fire tower. It's too cold. And the wind was blowing, just to help. So I put the little transceiver on my car dashboard, aimed it between the mountains, and started tuning. Suddenly, there was Chuck, loud and clear. Hey, I've made 10 GHz contacts with four states! Chuck had worked one state so far. Repeatedly.

OK, all we need to do now is make contact with Connecticut and Rhode Island and we'll have all six New England states. A few days later Connecticut was done. Rhode Island wasn't going to be easy. It's flat, and not all that close. Chuck found the highest hill on the map. There was no road to the top, so he had to climb it on foot, bringing his transceiver and a two-foot dish, just to give him a little extra pep. At the top of the hill he was surrounded by trees. The signal wouldn't be able to make it from down there. So he picked the highest tree and climbed, pulling up the equipment after he got into the topmost branches. It wasn't easy sitting up there, aiming the dish, and calling so I could tune from my end.

I also opted for height. In my case I drove about 10 miles to Mt. Monadnock, a 3,500-foot mountain, and climbed that, toting the transceiver. The road only goes halfway up the mountain, so I had some real climbing to do. How many mountains have you climbed?

So how about it, are there any areas of amateur radio that you'd like to pioneer? I guarantee that it's something you'll never forget.

Sherry was with me, but she couldn't quite make it to the top.

We had quite a time making the connection because Chuck couldn't keep the dish steady up there in the top of the tree. And it didn't help when a farmer came along with a shotgun and demanded he get off his property. It was a short QSO, but we made it. Wow, all six New England states, with all contacts over 50 miles and the New Hampshire contact over 100 miles. It was hard work, but it was fun too. I'd do it again in a minute.

So what next? Well, how about trying for a New York contact? The topographical maps were not encouraging. But we might be able to lob a signal over the Western Massachusetts mountains and make it. Chuck loaded his rig and dish into his car and headed west. I headed up Mt. Monadnock again, with another dish in tow.

I made it to the top, wheezing away and pooped. This is hard work for an old man like me. I walk a couple miles a day for exercise, but that isn't anything like climbing a mountain. On top I found myself completely enveloped in fog. The mountain was in a cloud and I couldn't see 10 feet. I set up a tripod and the dish, aimed it with my compass, and started listening for Chuck. It took us about 20 minutes of tuning and aiming, but suddenly everything clicked and there he was, S9+. Seven states!

These little 10 GHz rigs are simple and relatively inexpensive to make, so you could make a pair and have a ball. Chuck and I didn't do anything that thousands of other hams couldn't have done. It's just that we did it and they didn't.

With no further states within reach, we rested on our laurels.

Chuck had so much fun working New Hampshire from seven states that he decided to try and do it all over again on 24 GHz. But he reckoned without an ARRL stalwart who worked for MA/COM, the manufacturer of the diodes we needed for the rigs. He blocked our getting them because he wanted the ARRL to get the credit for making 24 GHz contacts instead of *73*. The end result was that no one ever did anything. I hate it when petty politics louses things up like that. If Freddie is still around, I hope he is pleased with himself for being so small-minded.

My experience on 10 GHz taught me that this band offers an inexpensive and practical alternative to 450 MHz links. The Southern California area 450 MHz band is packed solid with such links. I believe that virtually all of 'em could be moved to 10 GHz and all set up on one channel. The narrowness of the beams would keep them from interfering with each other. We found that a couple degrees swing of the antenna was all it took to go from S9+ to S-nothing. And on these frequencies you can have as wide a bandwidth as you want without bothering anyone. NBFM, wide-band FM, TV, or anything else.

They could move most of the 450 remote bases and link stations to 10 GHz, opening up 450 for more repeaters and even ATV in most large cities.

So how about it, are there any areas of amateur radio that you'd like to pioneer? I guarantee that it's something you'll never forget. I helped pioneer NBFM in 1946, 6m in 1948, RTTY in 1949, SSB in 1955, SSTV in 1967, repeaters in 1969, and computers in 1975. Now I'm retired and the ball is in your court. RF

A Few Memories of Radio, Part 1

Relive the golden age.

by Robert C. Green W3RZD

This is not an article on how to build a kilowatt amplifier in a thimble, or how to construct an 80 meter beam antenna on a doghouse. It is just a few recollections of many years of radio, of what it was like and what I've seen and done. I am not a youngster, not by any stretch of the imagination. I have been playing around with radio as an enthusiast, amateur, and broadcast engineer for 60 years, and all those years can be summed up in one word—FUN. If I wander a bit chronologically please bear with me.

Do you remember the first radio you had, and when?

The first radio our family had was in 1925, and it was a crystal set my dad built. It had a big tuning condenser, an even bigger coil of cotton-covered wire wound on an oatmeal box, and a galena crystal with its cat's-whisker. Metal clips were screwed on the board to attach the earphones, antenna, and ground. It was typical of the thousands of crystal sets in homes all over the country.

Newsstands sold pamphlets on the construction of sets, and on where to get mail-order parts. Locally, five and dime stores like Woolworth's, and some hardware stores, were a good source of parts.

Two-tube receivers with WD-11, WD-12 or O1A tubes were just coming on the scene and they were expensive; sets were made by Crosley, Atwater Kent and RCA. One tube was used as a regenerative detector and the other as an audio amplifier. Batteries were not included in the price; they were sold separately.

By the late 1920s, receivers were still not very sensitive or selective, and they used a TRF circuit (TRF meaning Tuned Radio Frequency). Receivers used as many as four stages tuned to the incoming frequency to get the gain needed. Each stage was either tuned by its own variable condenser and knob, or by condensers ganged by thin brass belts. If ganged by belts, a belt from a pulley wheel on the shaft of one condenser was looped around a pulley wheel on the shaft of the next condenser, until all the condensers were ganged. It wasn't long before a new type of circuit was developed: the superheterodyne. The superhetrodyne had more gain and selectivity and required fewer tuning condensers.

Tube-type radio cabinets were basically of two styles. One was a long box that resembled a small casket, made of either metal or wood, and commonly referred to as the "bathtub" type. It may have had as many as four tuning dials spread across the front panel, if the condensers were not ganged. The tuning dials, and perhaps the panel, were made of bakelite, and the four-inch dials had white gradations ranging from 0 to 100. Smaller knobs controlled the volume and tube filament voltage. Perhaps two pairs of earphones rested on the cabinet top. Wealthy set owners may have had a "Morning Glory" loudspeaker, which was a large earphone with an attached horn that resembled a big hearing aid trumpet. Those who couldn't afford a manufactured speaker placed a pair of earphones in a large soup bowl, which helped amplify the sound.

The other type of cabinet was a huge wooden box on spindly legs, and usually occupied a prominent place in the living room. When the set was turned on, the filaments of the tubes cast a soft light on the wall behind the cabinet; the brighter the light, the more tubes and the better the set. A large grille cloth on the front hid a tinny-sounding magnetic speaker.

Most broadcast stations were located in the center of town, and were housed on the top floor of buildings that may have had stores on the street level. The city-block-long building was usually bought, or leased, by the owner of the station, and reinforced to hold two heavy 50-foot, four-legged towers on the roof. The towers, 100 or more feet apart, supported an antenna of four or five wires strung between them. Since there were so few stations, each usually had call letters made up from the owner's initials. Few stations could boast of having more than 500 watts of power.

Later, when networks came into existence, there were Mutual, Columbia, and the National Broadcasting Company. NBC actually had two networks, the Red and the Blue, with each network feeding its own transmitter. Eventually the Blue network was sold and became the American Broadcasting Company.

Even as late as 1931, in some homes batteries were still being used to power receivers. Large #6 dry cells, known as "A" batteries, supplied the filament voltage. Two or three 45 volt "B" batteries were connected in series for the plate voltage, and perhaps a multi-tapped "C" battery of 1.5 to 7.5 volts was used for bias voltage. AC-operated sets had appeared on the market about 1930, but not everyone could afford their cost.

Antennas

From the very beginning of radio, one thing was for sure: A good antenna was needed. People who lived in the country were lucky because they could string up an antenna to a barn, a windmill, or a tree. Those unfortunates who lived in the city had to work hard to come up with an antenna, placing them in attics or under rugs, or on back-yard fences. One early antenna that had an impressive appearance was in the form of a fancy wooden cross, about 24 inches square and four inches wide. The center vertical post pivoted on a wooden base which rested on the top of the radio. Six or seven turns of wire formed a loop around the cross, and at the bottom of the loop two lengths of wire led down to the back of the radio. The loop antenna was also the input coil for the first RF stage. Today's receivers have loop antennas, only they are a small coil wrapped around a ferrite rod and mounted inside a shiny plastic cabinet. However, both the large loop on top of the receiver and the small built-in loop of today's portables serve the same purpose.

Rooming house tenants who were able to afford a receiver used the bedsprings or the galvanized wire window screens for an antenna, or dropped a wire out the window and hoped it would do. A lot of antennas were run along the baseboard, up and around door frames to the other side of the room. These worked pretty well until the room was repainted with lead-based paint which sometimes acted to shield the signal. I remember hearing of a lawsuit in which the home owner sued a painter for ruining the radio reception.

A good friend of my family was very proud of the antenna he had mounted on the back of a very large picture in his living room. The picture was about six feet long and three feet high, and was mounted on the wall directly above the receiver. He had fastened several turns of wire on the back of the frame, and was very proud that his antenna couldn't be seen. This was not a loop antenna, just a piece of wire. Later he discarded it and tacked a wire on the trim molding of the stairs leading to the second floor. He wouldn't admit he was having a hard time picking up his favorite programs.

Continued on page 6

Photo A. Early crystal set with lead galena crystal in soft metal holder and the "cat's whisker." Photo courtesy of W1HR.

Photo B: Replica of a typical 1925 amateur store in the Antique Wireless Association Museum.

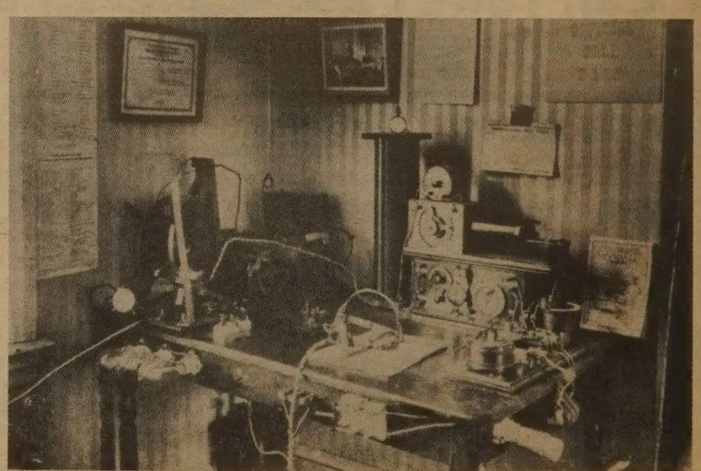


Photo C. Amateur radio 3AEP circa 1916. Photo courtesy of the Smithsonian Institution.

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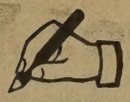
letters



Write to: Radio Fun, 70 Route 202-N, Peterborough, NH 03458

Greg Smith N8PPZ, West Carrolton OH Wayne, thank you for getting me up off my duff and upgrading. Thanks to you I finally passed the 5 wpm code test after taking it several times and failing because I procrastinated and did not really spend enough time studying. It's your fault that I am now a General, that I just couldn't stop, and I blame you, sir, for the fact that I am now trying to pound the Advanced theory into my head. Before I insult you too much, I just want you to know that I now see a reason to go on and get my Extra Class: because I WANT TO! Maybe I am foolish to think that the conversations on the lower bands are more interesting than they are on 10 meters and VHF. I am tired of an endless string of signal reports and 2 meter drivel. I guess it is too much to hope for (call me a dreamer), but I'll probably call you every name in the book if I find out that all other hams want are signal reports and QTH.

Ed Campbell KD4SMQ, Macon GA As a new no-code ham, I subscribe to several magazines. Like many new hams, my first radio choice was an HT. Nothing gets you "on the air" as quickly or as cheaply. I purchased a Standard 168 and really love it. It is very well-built; I have even dropped it onto a concrete floor with no damage. At home I connect it to an attic antenna and power supply. I also use it with a mobile mag mount, but often I just carry it in the car with the rubber duck and hit the local repeater just fine.

I am working on the 5 wpm code to obtain my Tech-Plus license, but I must admit that is not much fun and I often wonder, "What's the point?" Unless you can copy 13 wpm, there is little HF voice available to the new ham.

Question: With all the new no-code hams out there, why don't the manufacturers produce 6 meter rigs? A 2m/6m dual-band mobile would interest me.

Thank you for your magazine. How about some articles on 6m fun? RF

Making Copies

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TNX W5YI Report, Issue 19, October 1, 1993.

Hams Fight Arson

Ham operators in Oakland, California, are patrolling the East Bay hills in an effort to stop a recent rash of arson fires. Four volunteer hams are on the lookout team working in cooperation with local fire authorities.

Officials hope the additional presence will help to curb the purposely-set fires. The latest list of arson cases has reminded residents of the fire storm that killed 25 people in the Bay area back in 1991. *TNX Oakland Repeater Association, Oakland Tribune, and Westlink Report, No. 658, September 30, 1993.*

Rules Change: No Big Deal

So far the consensus is that there has been no significant change in amateur radio activity in the wake of the FCC's recent "Relaxing Restrictions on the Scope of Permissible Communications in the Amateur Service." The new Part 97 rules went into effect on September 13, permitting limited business communications on the ham bands.

Under the relaxed rules, hams can now make appointments, give weather report information to the National Weather Service, and order food. Fears that the VHF bands would become a pizza ordering service so far appear half-baked. *TNX W5YI Report, Issue 19, October 1, 1993.*

A Few Memories of Radio

Continued from page 4

Gimmicks

All kinds of radio gimmicks appeared on the market, most of them worthless. Many of the gimmicks were sold by door-to-door salesmen who disappeared long before the set owner realized he had been taken. One little item that really played on the ignorance of the radio public was the "Grid-Leak Drip Pan." Receivers that used a triode tube for a detector required a resistor in series with the control grid to get a bias voltage. The resistor was called the grid leak. The grid-leak drip pan was a metal cup about one inch long and half an inch wide, and perhaps half an inch high. It was to be placed under the grid-leak resistor to catch dripping electrons, before they could start a fire.

Another gem was the "Lightning Charged Antenna." It was simply a stick of charred wood with a few turns of wire wound on it. What made it so special, according to the salesman, was that it had been charged by lightning, which would make it attract more radio waves.

"Rejuvenated Tubes," whatever that meant, were another hot item. Along with this were tubes that had their type number changed to a type that didn't exist, and sold as a superior type for a high price. Not everybody was taken in by these or similar scams, but a good number were.

Magazines, such as *Radio News*, carried articles describing well-known broadcast and shortwave stations, complete with pictures. *QST* had articles on building amateur receivers and transmitters. All the articles had very detailed instructions on winding the coils, and proper placement of parts. Most of the transmitters described used a TGTP (tuned-grid-tuned-plate) oscillator. Hams called this a TNT circuit because they couldn't be sure when it would blow its frequency. Tube types such as 45s or 2A3s were used for the oscillator and final. If the set was AC operated, a type 80 tube was used for the rectifier. Photographs of stations showed two parallel wires, mounted on ceramic insulators, leading out a window to the antenna. A standard item for all stations was a large knife switch used to ground the antenna during a storm.

By now I was in love with anything that resembled radio. I saved part of my allowance so I could get the new issues of the magazines when they appeared; they cost 25 cents. Many a time I rode the streetcar to a parts supplier to buy a type 19 or 30 tube for 55 cents.

Portable equipment for amateurs included receivers using types 19, 30, 31, 32, 33, and 49 tubes. One of my favorite circuits was a type 49 screen grid tube in a regenerative circuit, and used just two flashlight cells for power. In this circuit the screen grid was used as the control grid, and the positive side of the 3 volts was fed to the regular control grid to boost the flow of electrons from the filament. The 3 volt source was also used for the plate and filament. With only a seven- or eight-foot antenna, it was remarkable the number of stations that could be heard. But as with all regenerative receivers, trouble was never far away; the receiver would oscillate too strongly and transmit the signal, sometimes for miles. This didn't endear me to the neighbors, although some trusted me to make repairs to their sets. It was a good way to make extra spending money, and guess what I spent the money on!

A good number of hams started using transmitters with a Colpitts or a Hartley oscillator circuit, which was more stable than the TGTP. If I'm not mistaken, it wasn't until 1934 that broadcast stations were required to use a crystal-controlled transmitter.

In a Washington, D.C., newspaper an article appeared about a man named Jenkins, who lived just outside the city, who was developing a method of sending pictures by radio. The articles also commented that RCA was also working on such a device, and they wondered who would be the first to succeed.

During the middle '30s, broadcast receivers were getting bigger, with more and more tubes and fancier dials. One manufacturer, Midwest, advertised sets with 23 tubes. A new manufacturer named Grunow started making home receivers. Some years later Grunow got out of the home receiver line and started making mobile equipment under the name Motorola.

About this time someone came up with the idea of connecting tube filaments in series instead of in parallel, and thus was born the famous AC-DC receiver. These sets usually had just five tubes, and no power transformer. They were called AC-DC because they could be used on either 110 volts AC or DC. There were still quite a few cities with areas that operated on DC, downtown areas especially. The sets hit the market with a very loud bang; they were the poor man's answer to a second receiver. Prices ranged from $6.95 to a high of $12.95. As the years went by, tube types changed and the quality improved until some were selling for $24.95. The five-tube AC-DC receivers were very popular and stayed on the market for over 30 years, until replaced by transistorized sets.

Car Radios

When tubes with a six-volt filament were introduced, this led to the development of the car radio. The tubes were ideal for this as cars had six-volt batteries. In 1935, new cars featured a behind-the-dash radio. Some of the new cars that had an all-steel roof, or "Turret Top," used an antenna that was two or three rubber-covered metal ribbons under each running board. (Don't ask what a running board was, they are also a thing of the past.) Car heaters were still not too common, so in older cars there was plenty of room on the firewall for the box that was the radio. Two flexible shafts from the box led to a control head mounted on the steering wheel column; one shaft was station tuning and the other shaft was volume.

Cars that still had a cloth roof used chicken coop wire for added strength between the layers of cloth, and the chicken coop wire was used for the antenna. I wonder how many farmers used chicken coop wire for an antenna before the automotive boys thought of it! Even though the filaments were fed off the battery it was still necessary to have high voltage for the tube plates. This was done with an electro-mechanical "vibrator," which chopped the battery voltage into a pulsating form so it could be stepped up in a transformer and then rectified. The radios drew up to 20 amperes, which would drain a car battery in a very short time unless the motor was kept running. Fathers would warn a teen-age son who borrowed the car for a date, "No parking and sparking with the engine off." It was cheaper to buy gasoline at 16 or 17 cents a gallon than to tow a car that had a dead battery.

Police cars were now using two-way radios, operating on frequencies around 2,000 and 2,600 kilocycles. The police cars had two batteries, and a new device called a Leece-Neville alternator in place of the generator, to keep the batteries charged. Police cars, marked or unmarked, could always be spotted by the distinctive whip antenna on the rear fender. The transmitter and receiver were trunk-mounted, due to their size and the necessity of being near the antenna's base, and were wired to a control box mounted under the car's dash. This was all new circuitry that hams later used. New broadcast radios for the home were being sold that would pick up police calls. These sets were advertised as, "You can now listen to the exciting moments of our police."

By 1939 some model cars had a vertical antenna mounted above the windshield, while other car models sported a chrome-plated whip supported by two black insulators on the front fender.

In 1938 portable radios became the rage, and another new set of tubes were developed. The tubes had 1.4 volt filaments and operated with 90 volts or less on the plate. A new set of batteries appeared just for the portables: the "A" and "B" batteries being in one package. A new type of speaker was used, the permanent magnet dynamic. All the portables had built-in loop antennas, and were housed in nice wooden cabinets. Newspapers and radio were carrying stories about Adolf Hitler in Germany, and how he could possibly start a war.

Well, I've gotten a little dry, guess I had better get a cup of coffee. How about coming back next month and we can talk some more? RF

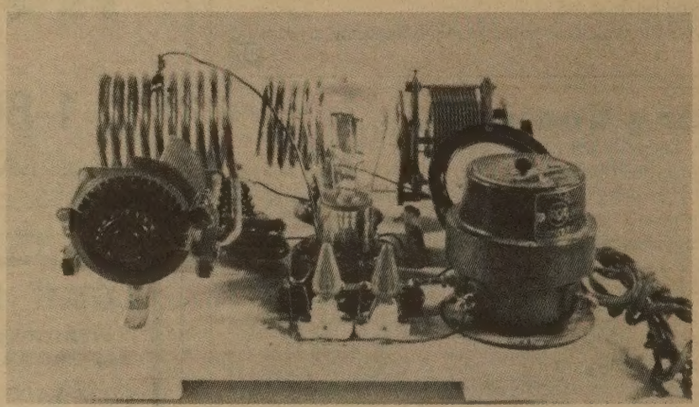

Photo D. Early CW transmitter circa 1924 using a single UV202 in a Hartley oscillator circuit. Note the Christmas tree lights used for the filament center-tap! Used by 8BJI/W2BJI. Photo courtesy of AWA.

ICOM Is Dealing

ICOM America is for the first time offering discount coupons for a variety of products that complement ICOM radios. Anyone purchasing a new ICOM radio between now and December 31, 1993, will receive a book of 32 coupons from 21 leading manufacturers who sell products and accessories.

ICOM's Chris Lougee says, "Virtually every time someone buys a new radio, they need additional components to go with that radio. ICOM is taking a leadership position in identifying complementary products and making arrangements to sell those products to consumers at a significant discount. We believe it will broaden the appeal of amateur radio."

High-Tech Highway

The Clinton Administration's Information Superhighway Plan is starting to take shape. The NTIA (National Telecommunications and Information Administration) will be given the lead role in its formation. The government's strategy calls for competing multiple cable, telephone, and computer networks.

Commerce Secretary Ron Brown will steer an industrial advisory council. You can expect major modifications to existing cable legislation and telephone restrictions. *TNX W5YI Report, Issue 19, October 1, 1993.*

Confirmation Likely

Communications attorney Reed Hundt is expected to be confirmed as the new FCC Chairman. Hundt was well received in his initial confirmation hearing before the Senate Commerce. Science and Transportation Committee.

The 45-year-old Hundt is a partner in the Washington law firm of Latham & Watkins, and he enjoys the friendship of Vice President Al Gore. Hundt has supported increased competition in the telcom industry and universal access to new information technologies overseen by the FCC. *TNX Electronic Engineering Times, September 27, 1993.*

Canada Loves its Hams

A seven-page full-color spread entitled "Loud and Clear" graced the pages of *Canadian Geographic* magazine's September/October issue. The feature article paints a sparkling picture of amateur radio operation in the Dominion.

The story was written by Janice Hamilton VE2JHJ and photographed by husband Harold Rosenberg VE2HRP. Rosenberg says,"I feel that spreading the good word about ham radio is very important, especially in the mainstream press." *TNX ES FB VE2HRP, VE2JHJ, and The Royal Canadian Geographical Society.*

Technical Opportunities Knock

There will soon be far fewer opportunities for blue-collar workers, and a lot more for those who possess technical expertise, according to an expert quoted in Electronic Engineering Times. Dennis A. Swyt, a Technical Manager at the Institute of Standards Technology painted a picture of an America where engineers and skilled technicians will gain influence and power.

Swyt delivered his remarks to the Engineering Workforce Commission. He added, "The most important occupation group in the U.S. today, and continuing in your lifetime and your children's lifetime, is that of the technical professionals." *TNX Electronic Engineering Times, Issue 767, October 11, 1993.*

Electrical Safety Revisited

by Richard McGillivray VE3TUM

I recently read (in a ham club newsletter) about a circuit which, according to the author, could be used to detect wet basement floors and would automatically activate a pump. This circuit had no fuse, no power switch, and no ground connection. Furthermore, there were no cautions in the article regarding the potential hazards of mixing electricity, water and the human body.

Most of us who work or play with electricity have, at one time or another, received a shock. The majority of us live to tell the tale, and are more cautious the next time we have our hands on something electrical; however, that is not always the case. Under the right conditions—or perhaps that should be the wrong conditions—*electricity kills!* It's not always a high voltage/high current combination that creates a Silent Key. An insidiously small current and comparatively low voltage joined with a good conductive path through the human body can be fatal.

What happens when we get an electric shock? A shock is experienced when our bodies become part of an electric circuit and current flows through us. How the shock effects us depends on the voltage, the voltage source (AC, DC, RF), the amount of current, the current path, the area of contact, and the equivalent circuit presented by the body. All these factors will determine the outcome of an electric shock.

The Body

Simply, we can think of our bodies as biological feedback systems. Nerve impulses are continuously carrying information to and from our brains to maintain normal body functions. These electrical nerve impulses provide both internal and external sensory information and muscle control. When we get shocked we inadvertently introduce an additional electrical signal. The consequences may be very serious.

There are three general effects produced by electric current flowing through the body: 1) heating, 2) stimulation of nerve and muscle tissue, and 3) electrochemical changes[1]. Of greatest concern is number 2), for among the body's muscles can be included the heart.

Let's take a brief look at how the body appears from an electrical point of view. The skin is the first line of protection between the outside world and the internal organs. The outermost part of the skin is a dry horny layer (epidermis) which is, when dry and intact, a poor conductor of electricity. Directly below the epidermis are the dermis and the subcutaneous layers[2]. These inner layers contain blood vessels, nerves, sweat glands, hair follicles, fat and conductive fluids. Current entering these conductive areas of the skin can find a path to the internal organs. It is the electrical resistance of the skin which limits the current when you come in contact with a voltage source. This resistance depends on the amount of water and oil in the skin and the area of contact. The skin resistance is inversely related to the area of contact. For normal intact skin and a contact area of one square centimeter, the resistance may range from 15,000 ohms to 1,000,000 ohms. A typical value would be 100,000 ohms. However, if the skin is broken or wet, the resistance can drop to one percent of the dry value. The internal resistance of the body between any two limbs is approximately 500 ohms[3].

As previously mentioned, the effect of an electric shock on the heart is of the greatest concern. A cross section of the heart and its normal electrical signal are illustrated in Figure 1A. The heart is a hollow muscular organ situated in the chest between the lungs and above the diaphragm. As we all know, the function of the heart is to pump blood around the body. Blood from the body which is depleted of oxygen enters the right side of the heart where it is pumped to the lungs for oxygenation. This oxygen-rich blood then enters the left side of the heart and is pumped back to the body. The major pumping action is done by the ventricle chambers of the heart. The heart has a very regular electrical rhythm that can be displayed on an electrocardiograph, as seen in Figure 1B. The heart, however, is very susceptible to electric current. If sufficient current passes through the heart to disrupt its normal electrical activity, the heart will go into ventricular fibrillation. The disorganized electrical activity of the heart during ventricular fibrillation is illustrated in Figure 1C.

Fibrillation is a condition that occurs when the muscle tissue of the heart does not move in a synchronized manner[4] and is characterized by rapid uncoordinated activity. During ventricular fibrillation blood is not pumped to the lungs or body. To make matters even worse, ventricular fibrillation will not stop when the current is removed. Medical attention is required immediately. Ventricular fibrillation is

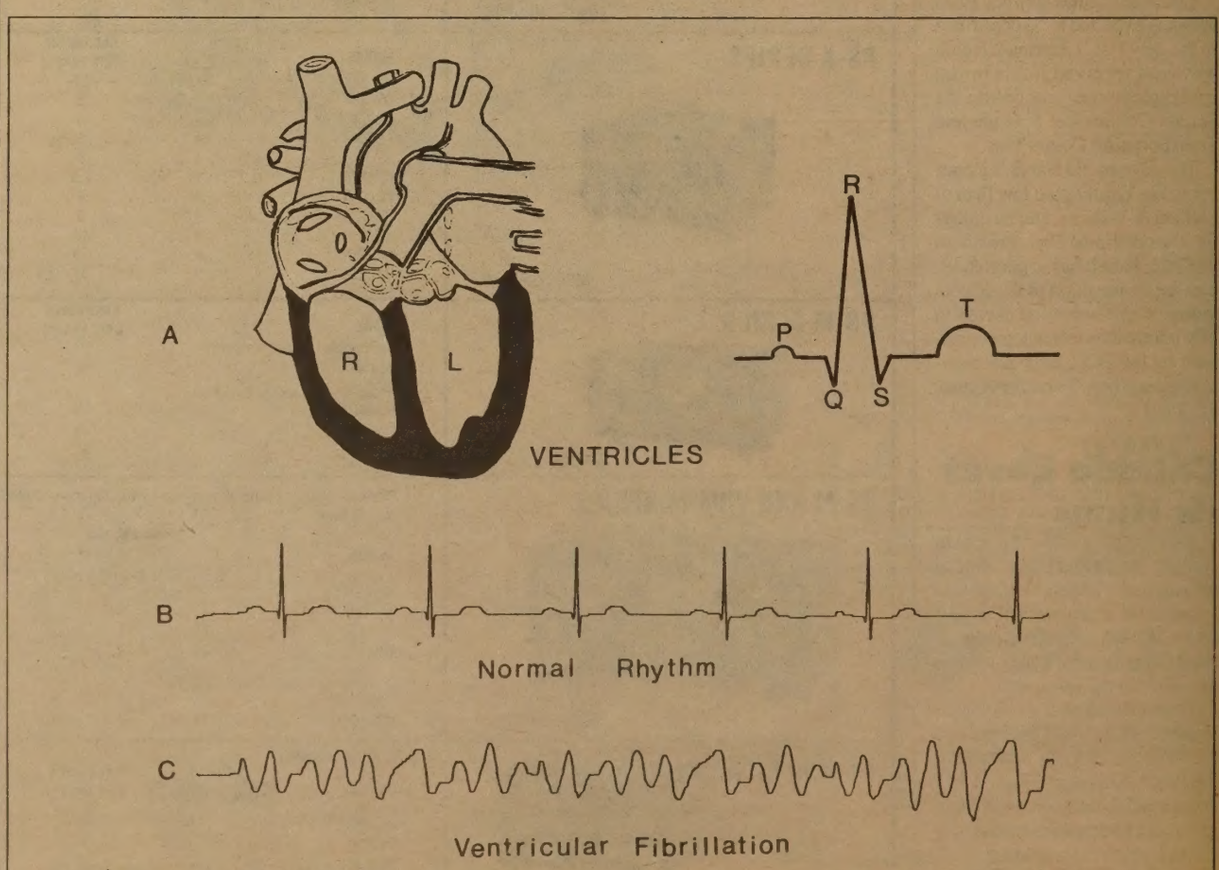

Figure 1. A) The human heart with its normal electrical signal. B) The heart's normal signal pattern has a smooth rhythm. C) Ventricular fibrillation is a disorganized signal which often results in death.

the primary cause of death by electric shock.

Types of Electrical Shocks

There are two general classes of shock: macroshocks and microshocks. A macroshock is a whole body shock of high current levels (tens of milliamps to amps) passing from limb to limb through the body. A microshock is a shock of low current value (microamps) entering the blood and being conducted to the heart along veins and arteries. Microshocks are not usually a concern in the work place, in the home or in the ham shack. Only under very special circumstances would most of us be at risk due to a microshock. An example of such a case would be if both hands were wet, you had a bleeding cut on either hand and you received a hand-to-hand shock. Under these conditions, there would be a good conductive path to the conductive tissues, body fluids and possibly to the heart. In this case, currents from 40 to 100 microamps could cause ventricular fibrillation and death.

It is macroshock which most of us experience primarily from touching an AC 120 volt 60 Hz voltage source. What is the effect of an arm-to-arm across-the-chest shock? The answer to that question depends on the current that flows, which in turn depends on skin resistance factors and how the current distributes itself through the chest. Considering dry intact skin, one milliamp is the threshold of perception and 5 milliamps is the maximum current which can be regarded as harmless. The range of currents from 10 to 20 mA is referred to as the "let-go" current. In this range sustained muscle contraction does not occur and you can still release yourself from the offending part. Between 20 and 50 mA involuntary muscle contraction, pain, fatigue, and possibly respiratory arrest may be experienced. From 50 to 1000 mA ventricular fibrillation can occur. In the range of 1 to 6 amps an interesting process takes place. At these currents there is a sustained contraction of the heart muscle, no ventricular fibrillation takes place, and when the current is removed the heart will return to normal activity. High current densities can result in serious burns and tissue damage. The effects of the current values and boundaries[5] stated above will vary from individual to individual.

Let's look at a couple of examples of hand-to-hand across-the-chest shocks from an AC 120 volt 60 Hz source:

(1) The skin is dry and intact—skin resistance of 100,000 ohms:

skin		body		skin
100K	+	500	+	100K

Total resistance equals 200,500 ohms.
The current is approximately 600 microamps.
Below the threshold of perception.

(2) Moist intact skin—skin resistance of 20,000 ohms:

skin		body		skin
20K	+	500	+	20K

Total resistance equals 40,500 ohms.
The current is approximately 3 milliamps.
Perceptible, but not life-threatening.

(3) Wet intact skin—skin resistance of 1000 ohms:

skin		body		skin
1K	+	500	+	1K

Total resistance of 2500 ohms.
The current is 48 milliamps.
A life-threatening situation—on the threshold of ventricular fibrillation.

(4) Wet skin and an open wound on one hand—skin resistance 1000 ohms:

skin		body		skin
0	+	500	+	1000

(the combination of an open wound and wet skin effectively removes all skin resistance on one hand.)
Total resistance 1500 ohms.
The current is 80 milliamps.
Ventricular fibrillation!

In this last case, since a good conductive path is provided into the conductive fluids of the body via the wound, a microshock hazard may exist.

Most of us live to tell the tale because our skin is reasonably dry, and intact, and the current is above the perception level and within the "let-go" boundaries.

Two additional areas we should look at are DC shocks and RF burns. There is a relationship between the frequency of the current and the shock phenomenon. As the frequency moves above 1000 Hertz, both the perception of the current flow and the probability of a life-threatening ventricular fibrillation disappear. However, radio frequency (RF) energy will cut and burn tissue. An application of this process is used in hospitals during surgery.

Electrosurgical generators, or electrosurgical units (ESU), are employed during surgical procedures to make incisions. An ESU operates in the frequency range from 300 to 3000 kHz, with an adjustable power output from 10 to 300 watts[6]. Figure 2A illustrates the basic setup. The tissue beneath the active electrode is heated to destruction! Your HF rig functions very nicely as your personal ESU (see Figure 2B) and the antenna is the active electrode. When working on the antenna, the rig should be turned off and/or disconnected from the antenna. When working on the rig itself there is the potential for AC, DC, and RF shocks.

DC Shocks

The primary concerns surrounding DC shock hazards are burns, tissue and nerve damage, and injuries resulting from a violent reflex action. The probability of ventricular fibrillation or other life-threatening cardiac arrhythmias is low, although not zero. A high-energy DC shock occurring during the T-wave portion of the cardiac cycle (see Figure 1A) could result in an R-on-T event[7], followed by ventricular fibrillation. The same precautions you use when dealing with AC and RF currents should be diligently applied to the DC environment.

Protection

How can we protect ourselves from getting a shock? Three ways come to mind.

AWARENESS: Be aware of the currents and voltages you are handling. Be aware of the frequency of the current. Be aware of the environment in which you are working. Be aware of the risks and manage them safely.

CAUTION: If in doubt, check it out personally. Is the power turned off? Am I a high resistance and dry? Is the antenna disconnected from the rig? Where are the overhead power lines? Ask yourself all the lifesaving questions.

THINKING: "I think, therefore I am."; Rene Descarte, 1596–1650. Concentrate on the task at hand. Think about what you are going to do before you do it. Think about the safety measures you need before you need them. Think about the safety of others involved in the work.

How we ACT can save our lives. Save a life—tell a friend about electrical safety. RF

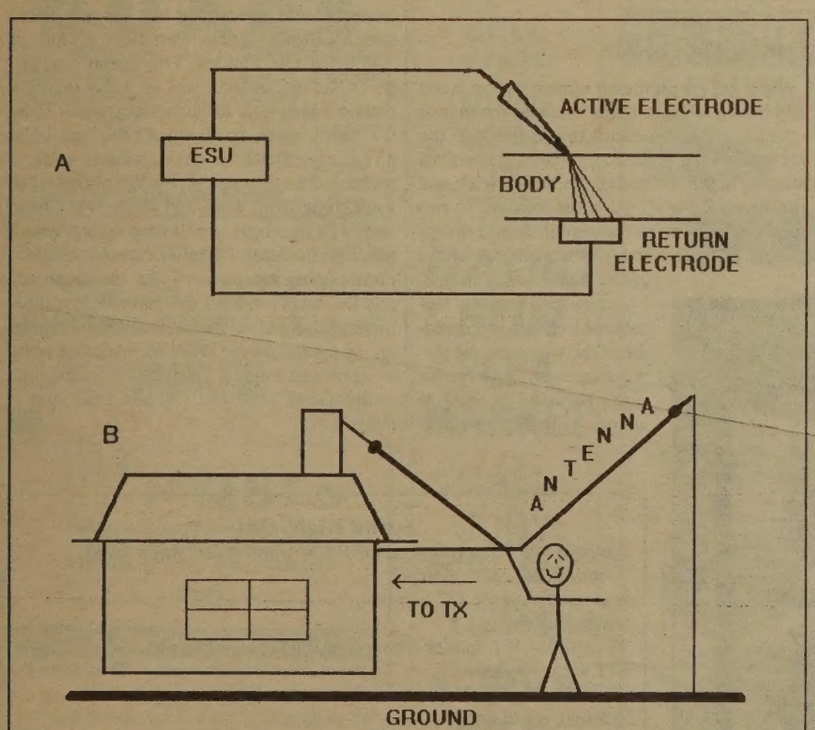

Figure 2. A) Electrosurgical units (ESU) are employed in hospitals to make incisions. The tissue beneath the active electrode is heated to destruction! B) Your HF rig functions very nicely as your personal ESU and the antenna is the active electrode. When working on an antenna, the rig should always be turned off or disconnected.

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RF kit review

Oak Hills Research
20879 Madison St.
Big Rapids MI 49307
1-800-842-3748 (Orders)
Price Class: $109.95

Oak Hills Sprint

by Jeff M. Gold AC4HF

The Sprint kit has a low parts count and a silk-screened board, is 100% complete, can be tuned for any 100 kHz of the band, and is fairly inexpensive. These factors make this a kit for any Novice or beginning kit builder to consider. For the Novice, a 40 meter kit would be a good choice. The radio can be used on the Novice portion of the band and then later easily retuned for another portion of the band.

The first steps I always take when a new kit arrives are to carefully unpack all the parts and examine the quality of the components. After I have done this, I take pieces of paper for each type of part. I set up one piece of paper for resistors, one for capacitors, and label each part of the paper with the appropriate number from the parts check-off list. I then start to unpack the small parts and put the leads through the correct place on the paper. By following this procedure I make sure that all parts are included in the kit and that they are really easy to identify when I start to place them on the circuit board. I find that by doing this first I enjoy the assembly process much more and I make far fewer assembly errors. The vast majority of problems associated with kit building are due to putting parts in the wrong place, or to poor soldering joints.

I followed the above procedure for the Sprint. All parts were included in the kit and were of good quality. Kit builders are sometimes scared off by winding their own coils; with this kit the coils are all pre-wound. The circuit board is good quality and has plated-through holes. I am currently building a kit with good boards that aren't plated through, and boy do I notice the difference. With plated-through boards you apply the heat and solder and the board seems to suck up the solder. The results look great and the solder joints are really solid, mechanically and electrically.

Simple Instructions

The directions aren't step-by-step, but they are easy to follow. The board is silk-screened and there is a very nice large parts overlay, so putting the parts in is a breeze. When you have to do more than just put resistors or capacitors in, the directions become more detailed and are very clear. With some help, a beginner should be able to do this fairly easily. I like to put the lowest-lying parts in first—this way the IC sockets and other parts sit flatter on the board.

"If you are planning to use the rig for portable or backpacking use, this may be a good choice."

The cabinet is very nice and all plugs and jacks are included. The rig is *very* small. It draws very little current. I had been trying to drain a 12V 4 Ah gel cell before recharging it to take on vacation. The battery didn't have a real good charge to start with. I left the receiver on from the time I got home from work 'til I went to sleep and did a lot of operating with it. The rig took a lickin' and it kept on tickin' for quite some time before draining the battery.

The receiver works nicely. This is my first Direct Conversion (DC) Receiver. I have read about downsides to them as well as their good qualities. A DC receiver picks up signal energy from above and below a given frequency equally well. For instance, if you are tuning a station that is on 7.040, as you tune up the band the signal will get stronger until you reach a point where it seems to disappear. This is the center frequency or "zero beat" frequency. As you tune immediately past it the signal will once again become strong and then begin to weaken. If there is much noise on the band from other stations (QRM), the noise can seem worse than it really is. The DC receiver can also become overloaded from commercial AM broadcast stations. This doesn't mean that this type of rig can't work well, but you need to get used to tuning in a signal. An advantage to this design is that the rig can be made very small and lightweight and can be sold for a very reasonable price. If you are planning to use the rig for portable or backpacking use, this may be a good choice.

Getting On The Air

I put the rig on the air during the weekend and it took a few minutes to learn how to tune a station. The directions that come with the kit explain the procedure clearly. It involves starting at the "0" end of the tuning scale and tuning until the signal is the loudest. If you tune past this point the signal should disappear at one point and then start to get louder again. While tuning around, I usually tune past the signal until it is right in the middle of the wave and the signal disappears. Then I make sure I'm on the correct frequency by tuning up a little past and then down again to the correct side of the wave. It only takes a few seconds and it really seems to work well. I have been getting most people I call coming back to me on the first shot using the 1.5 watts the rig puts out.

This last week the 30 meter band around here has been real bad. There was a lot of noise on the band. It sounded like there were thunderstorms inside the rig. I was still able to get through the noise and make contacts. I sometimes had problems with other stations covering up the signal I was trying to hear; they didn't even have to be on the same frequency. This was caused by the DC receiver hearing both sides of the wave.

Still, I enjoy operating this rig. It makes a nice backpacking or portable transceiver. I use a small gel cell and my portable PVC vertical antenna. The whole setup is very portable and only takes a few minutes to set up. I have had very good results with this portable station setup.

I have tested the Sprint side-by-side against a number of small Superhet type QRP transceivers. I still like a superhet better. I find them easier to operate and less likely to be run over by strong signals from other stations or AM broadcast stations. This doesn't mean I don't like the Sprint. I was on it this morning and the bands were behaving fairly well. There was some noise, but it wasn't too bad. I had a real nice QSO for over an hour with no problem. I usually turn on the Sprint first when I get home from work and see how the band is. If I hear people, I will usually work with the Sprint first. I find it is a little more challenging because of the lower power and DC receiver, but I still have little trouble making contacts. I have received good reports on my transmissions. When the bands are noisy or crowded I use a switched capacitance audio filter with the rig and find that it helps a lot. RF

The Oak Hills Research Sprint QRP CW transceiver kit.

Sprint Highlights

Sprint is a W7EL optimized QRP CW transceiver: single band for 80, 40, or 30 meters.
High performance DC receiver.
Diode ring mixer.
VFO tuning 8:1 vernier—covers any 100 kHz of band.
RIT w/center detent.
Peaked audio filter.
Sidetone oscillator.
Smooth QSK.
1.5 watts.
All coils prewound.
12 VDC.
100% complete kit.

RF user's report

The Sony PRO-80

by Fred Allen KAØYAE

The Sony PRO-80 is a hand-held PLL synthesized receiver that covers 150 kHz to 223 MHz, in AM wide, AM narrow, FM wide, FM narrow, and SSB modes. (The 115.15 MHz through 223 MHz range is received using the FRQ-80 frequency converter which is included with the radio.) The manual is straightforward and you should have no problem understanding the PRO-80's functions after reading it.

Getting Started

The PRO-80 can be either manually-tuned or direct-tuned. When you direct-tune, just press the direct button, input your desired frequency and press the execute button. The frequency will then appear on the display. If you make a mistake you will hear a beep, and a "Try Again" message will appear on the display. This message will disappear after five seconds and the previous frequency will return.

To manually tune the PRO-80 you simply press the +/- buttons located near the bottom of the receiver. The frequency will change at different intervals depending on what band your in.

You can store up to 40 frequencies on four memory pages (10 stations per page). You can switch from page to page by rotating the page knob located on top of the receiver. Each memory not only stores the frequency, but also stores the last mode that was used on that frequency. This is really handy if you do a lot of band scanning.

Speaking of scanning, you can program the PRO-80 to scan in three different modes. It can be stopped at the first located station, or resumed after each station located has been received for several seconds, or until the signal stops. You can also use the squelch control so that the receivable signal level can be adjusted so that scanning stops at stations with strong signals, and passes over unwanted noise or frequencies where no stations are present.

The user can also utilize the limited scan tuning function. The stations in the desired frequency range can be scanned by defining the upper and lower limit frequencies that you would want to scan. For example, let's say you want to check out the action between 10 and 15 MHz. You would enter your lower limit of 10 MHz and your higher limit of 15 MHz, then press scan, and the PRO-80 would search for all the active frequencies in that defined band.

Another function is the Fine/SSB control. You can use this function when listening to sideband or when you're in the AM wide or narrow modes. It is a nice feature on field day when you are running a QRP rig and need a good receiver. It can also help the avid AM broadcast DXer cut through some of that ever present QRM he finds in the AM broadcast band.

The other functions on the PRO-80 are common and are found pretty much in other receivers of its class. These include key lock protection, memory protection, priority tuning, earphone jack, recording output jack, tone control, and a light button used to illuminate the display window for approximately 10 seconds.

Bells and Whistles

The supplied FRQ-80 frequency converter shifts the frequency coverage to 115.15-223 MHz to allow the reception of these frequencies. You do this by first inserting the FRQ-80 frequency converter in between the the telescopic antenna and the connector to the receiver. Then just follow the directions in the manual and you will be able to receive ham, public service, aircraft, and other communications in the VHF band. The FRQ-80 also has a attenuator switch (0-30 dB) for interference from a strong adjacent station, and also a filter switch you set when either in the 115.15-174 MHz, or 174 MHz-223 MHz range. The FRQ-80 runs on 3 volts DC, (two AA batteries), and you should be able to get about 80 hours of use from the batteries. When the converter is not going to be used for a long period of time make sure you take them out to avoid damage caused by battery leakage.

The accessories supplied with PRO-80 include a FRQ-80 frequency converter, telescopic antenna, earphone, shoulder strap, carrying case, antenna holder, antenna plug adapter (BNC to TNC), and a "Shortwave Handbook." Some optional accessories include an AC power adapter (AC-D4), rechargeable battery pack (BP-23), and a car battery cord.

The PRO-80 weighs approximately one and a half pounds. The antenna jacks are of the TNC type, which is nice because of the limited room on top of the receiver. The PRO-80 runs on 6 volts DC (four AA batteries), and you will get approximately 10 hours of use out of the batteries before they will have to be replaced.

Although the Sony PRO-80 has been around for about five years it can still be purchased new for around $400. I have seen numerous used units offered for sale in the $225 to $300 range. RF

Operation Holidays and Amateur Radio

by Lorraine S. Matthew N4ZCF/AAA9PR

Since mid-October, amateur radio operators everywhere have been called upon to take part in a public relations program called *Operation: Holidays*. This is the third year of the program and it is my hope that, like last year, you in amateur radio will respond with enthusiasm as individuals and through the radio clubs to which you belong. You who are new to amateur radio can take this opportunity to serve the community in which you operate.

Operation: Holidays is a campaign in which all amateur radio operators and MARS members are encouraged to promote the sending of holiday messages as a service to the general public. The aim is to acquaint the public with the services that amateur radio can offer. As a result, we hope to spread holiday cheer far and wide with our special communications capabilities.

This dual approach emphasizes the amateur radio community's two fine message systems: The National Traffic System (NTS) carries civilian-to-civilian traffic (messages), and the MARS system carries military-to-civilian-to-military traffic. People everywhere could supplement the usual sending of greeting cards with radiograms and MARSgrams. The senders and recipients would both enjoy this different approach to maintaining friendships.

The public needs to know that both the NTS and the MARS systems are up and running and are highly capable of carrying messages to and from loved ones. The ultimate goal is to have the public develop such familiarity with the two traffic systems that the sending of radiograms becomes a habit.

Achieving this goal requires that amateurs everywhere make the effort to inform the public about the services that are available and about how to contact the appropriate operators who handle message traffic. What better time of year is there to extend a warm welcome by amateur radio to our friends and neighbors in the community? You, who have just entered the amateur community, have an opportunity to build a bridge of understanding between the general public and your newly-found radio world.

How does the non-ham radio public find a traffic-handling operator? You, the new ham, can be instrumental in helping people make this discovery. If you don't know a traffic handling operator, your local amateur radio club would be the best source of information. If you are not yet a club member, join now. Your new ideas can blend with the ideas and knowledge of the experienced amateurs that you meet there.

This program gives amateur radio clubs an opportunity to be of service to their respective communities. Clubs usually have some traffic-handling operators among their members. If your club doesn't, someone in the club will probably know someone who does handle traffic. That operator might be enticed to join your club.

All amateurs and clubs have the capability to inform the public about the availability of free and reliable services offered by amateur radio. All clubs are capable of connecting the public to the appropriate operators for service.

All amateurs and clubs have an obligation to the public. That public should be served by amateur radio. Only an informed public, using the services available to them, will know that amateur radio is an important service. Only an informed public can help to protect the amateur bands from being usurped by others. Only an informed public can make legislators and regulators see the value of amateur radio as a national asset.

Many people don't even know that these message services exist. This is our opportunity to let the public know that both services are free, reliable, and available at all times—not just during the holiday season.

The messages themselves are a source of valuable practice for the operators who handle them—practice for traffic handling during emergency disaster services, for which amateur radio is better known.

Have you ever sent a radiogram? Why not? It's a great way to keep in touch with friends. All you need is a complete address, telephone number and 30 words. Most people are surprised at how much can be said with 30 words. Try sending a radiogram today. You and your recipient will like it.

Watch for *Operation: Holidays* news, notes, and bulletins. Help make this a busy, happy and informed holiday season for everybody. Let this holiday season and the coming new year be the start of an era in which amateur radio is joined in unity and service to our communities.

Happy Holidays to you all. If you need further information or materials contact me at this address:

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Santa Rosa Beach FL 32459
(904) 267-4673
Packet: N4ZCF@N4GXX or
AAA9PR@AAT4BM

RF

the tech side

by Michael Jay Geier KB1UM

The Essential Walkie, Part Two

Last month, we covered the basic functions of a modern, microprocessor-controlled HT. This time, let's look at some of the more advanced features.

In the beginning, there were lovely repeaters, and there were not enough of them to bother each other. There was peace in the land. Then, the repeaters started to multiply and their numbers grew until . . . yikes, interference! Was there a way out?

At the Tone . . .

This is one time when the commercial radio interests beat us to the punch. Motorola, a major developer of commercial repeater systems, discovered early on that there was a need to use some sort of signaling scheme to avoid mutual repeater interference. Consequently, they adopted what they call Private Line, or PL, which is their trademark for a tone-signaling system now generically known as CTCSS, or continuous tone-coded squelch system. It sounds complicated but, actually, it's pretty straightforward. In a CTCSS system, a low-frequency audio tone is sent by the transmitter at a low level along with the voice modulation. The tone is sometimes referred to as being subaudible. In truth, though, some of the tones, which range from about 67 Hz to 256 Hz, can clearly be heard because they fall into the normal speaking voice frequency range. Still, they are sent at a low enough level that they aren't bothersome.

At the repeater's receiver, a very selective audio filter detects the presence of the correct tone and keys the transmitter. Naturally, any signal not carrying the right tone will be ignored. The result is greatly reduced interference. Of course, an interfering signal can still cause problems if it occurs while a legitimate user is on the repeater, but at least undesired signals won't key the repeater when no one is using it.

By the way, if you're wondering why such a crude system was chosen over a more sophisticated, digital-coding scheme, the answer is that CTCSS was developed before the required digital technology existed. Motorola used mechanical reeds as narrow-tone filters; the reeds only vibrated when the pitch at which they resonated was present. And, you could change the reeds quite easily if you needed to change tones. Not only was that technique used on repeaters, it also was extremely successful with pagers, which usually had two reeds inside and required the sending of two consecutive tones. When you think about it, it's pretty clever!

We Like It, Too

As our ham repeaters started getting numerous enough to experience mutual interference, we turned to CTCSS as well. You won't find it in use in very many sparsely populated areas, but if you go to a major city like Los Angeles, nearly every repeater will require it. While CTCSS encoders used to be exotic options, just about all of today's walkies have them built in. In fact, many even have tone *decoders*, too. Why have a decoder? Well, it helps *you* avoid receiving interference, as long as the repeater is sending, as well as requiring, tones. Some do, some don't. Also, you can use the decode function as a kind of simple selective calling system when you are on a repeater which *doesn't* require CTCSS. It works like this: You want to catch a call from a friend, but you're not sure when it's coming and you don't want to listen to all the other stations chattering away in the meantime. If you and your friend agree on a tone, you can set your decoder for it and it will squelch everybody else, opening only when your friend sends the correct tone.

I've used this technique many times, and it works great. There are some restrictions, though. First, as I said, the repeater must not be using tones itself, or your friend's encoder will be tied up for use in opening the repeater. And, of course, all the other users will be sending the same tone, so there will be no way to distinguish between them. Also, some non-CTCSS repeaters just don't have the low frequency response in their audio channels to pass the lower tones, so they get cut off and are never retransmitted. An easy way out is to choose one of the highest tones. These fall squarely into the normal voice range, so all repeaters will pass them.

Finally, CTCSS is quite handy at hamfests, where other transmitters are so close that they keep opening your receiver, even though they aren't on the same frequency. In this case, of course, it doesn't matter which tone you choose.

Pick a Tone

Let's say you are in a strange city and you want to get on a busy repeater to ask for directions or other local information. You hear plenty of people talking, but when you try to break in, no one notices you. Are these folks rude or what? More than likely, they are not hearing you because the repeater requires CTCSS and you are not sending it! But how can you know which tone is in use?

If you have a CTCSS decoder, set your radio for decode operation. Most likely, it will go silent. Now, go into the tone setting mode and slowly step through the tones until the audio wakes up. You've found the right tone and can now program your transmitter to send it. But with some new rigs you don't even have to go through this rigmarole, because they have a CTCSS scanning feature that identifies the tone for you. Slick, huh?

While most repeaters retransmit incoming CTCSS tones, some do not. If the repeater isn't retransmitting the tone, it can be hard to figure out which one is in use. In this case, you must try to pick up someone's signal on the repeater's input frequency. (To listen to the input, select the "reverse" mode on your walkie or retune

RF review

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The ASA 9244 Dual-Band Antenna

Go mobile without going broke.

by Charles Warrington WA1RZW

If you're one of those thousands of recently licensed amateurs looking for a low-cost mobile antenna, listen up. Antenna Sales & Accessories is offering a quality dual-band 2 meter/440 MHz magnetic mount for a very low price.

The Model ASA-9244 Antenna is a pretuned dual-bander. It acts as a 1/4 wave on the 2 meter band, and as a 3 dB gain antenna on the 70 centimeter band. The main advantage of this antenna is that it is practically invisible on your car or truck.

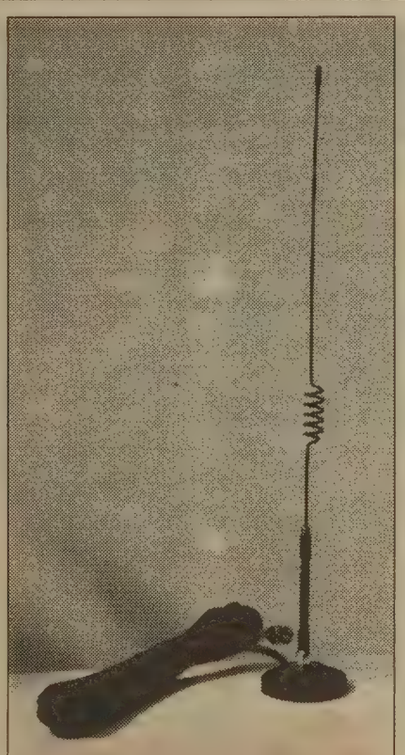
Unlike some mag-mounts that scratch the heck out of your vehicle, this one is mercifully small, yet versatile. It gets you up and running on VHF and UHF mobile operation in no time.

The ASA-9244 weighs only 8 ounces. The powerful magnetic base is 2-1/2" in diameter and has a protective bottom cover. The overall height is 17-1/2". Its small size and weight characteristics combine with its strong magnetic base to provide a dependable mount with negligible wind loading. This antenna has survived testing in 100 mph winds!

The 1/4" coiled Fiberglas bottom section is helically wound with rugged heat-shrink protection to a height of 4". The flexible black cellular-look stainless steel whip is 13" high.

The unit is shipped complete with 12 feet of RG58 coax with a PL259 or BNC connector attached. The construction is sturdy—the antenna is all black with brass/chrome ferrells, and it is made in the USA. This product is definitely plug-and-play.

I tested the ASA-9244 with a 5 watt HT during my two-hour-per-day commuting time. On 2 meters, the 1/4-wave ground plane is a vast improvement over a little helical duck, and only a tad worse than a 5/8 whip. Performance



was equally good on 440 MHz. Although A.S.A. has carried this product for about two years, they recently hooked up with a new American manufacturer and the quality of these new units is surprisingly good, given the price.

If you live way out in the sticks and need all the gain you can get, you probably should look into something a little more elaborate. But if you're just gettin' your feet wet and live within range of a repeater or two, this may be the answer for you. RF

the radio to the input frequency.) Once you get a signal, you can pick out the tone with one of the above procedures. Of course, you usually can avoid all this trouble if you have a repeater handbook, because the book will show the tone in use and you can simply program it in.

The New Way

In some busy cities, there's so much ham activity that the desire for selective calling (which basically goes against the ham tradition of a giant party line) is quite large. The radio manufacturers have responded by designing a new, digitally-based paging scheme. This one sends a quick sequence of DTMF (dual-tone, multi-frequency) tones every time you press the transmit button. These are the same tones used for normal telephone dialing. Your friend's decoder is set to the same sequence, and only that set of tones will open his squelch. It seems like a great idea, right?

Nope, Sorry

Unfortunately, the manufacturers really fell down on this one. They chose a system which uses only the tones for the numbers 0-9. They did not include the pound sign and star, or the A,B,C and D tones. As it happens, most modern repeater controllers are designed to deliberately stop DTMF tones from being retransmitted. They do that to avoid having unauthorized users and jammers hearing (and thus being able to decode) the tone sequences used to enable the autopatch (connection to the telephone network). While most of these controllers have a special tone sequence which temporarily disables this protective function, it nearly always involves the use of those unincluded tones. So, the paging function is useless through most of the repeaters in the USA. Of course, you can still use it for simplex operation at a hamfest, but why bother? CTCSS is much easier to set up and it does the same job.

As a result of this basic incompatibility with most repeaters, I consider DTMF paging a worthless feature, and I certainly wouldn't recommend you pass up an otherwise desirable rig because of its absence. More and more, though, it is being included as a standard feature, so you may wind up getting it anyway. I know lots of people who have it, but I don't know anyone who uses it.

It's Covered

Last time, I mentioned that almost all new radios include extended coverage, allowing you to use them as public service band scanners. Typically, they go up to 170 MHz or so, and some go down all the way to the aircraft band. If you get one that covers aircraft, be sure it actually includes AM detection, because that's what aircraft radios use. Some can do it but require modifications to enable the feature.

Autodialers

An increasingly popular feature is the autodialer, which lets you store in memory several phone numbers, along with the code numbers required to activate the repeater's autopatch system. This is a very handy device, especially if you use the radio in your car, where you don't want to be distracted trying to enter numbers while you drive. Some rigs, though, require as many as four or five keypresses to send the stored number, while others will do it with just one button. I recommend you ignore the difficulty of entering and storing numbers (which you rarely do) and concentrate on how much trouble it is to send them. The fewer steps required for sending, the better.

Can You Handle It?

As you can see, today's HTs do so much that you can get lost just trying to figure it all out! The radios' makers recognize that, and some attempt to remedy the situation by offering different modes of operation for users of varying experience levels. In the "simple" mode, the radio is easy to use but has few features; you have to go to the full-featured mode to get at the goodies. I've tried a few such rigs, and I don't care for that approach. If you really want to get the most out of your purchase, I suggest you just dive in and learn it a little at a time.

Double Pleasure

So far, we've looked only at the features available on the normal, single-band HT. But today, dual-banders are becoming quite popular, and they include some extra features specifically related to their versatile nature.

Hearing Double

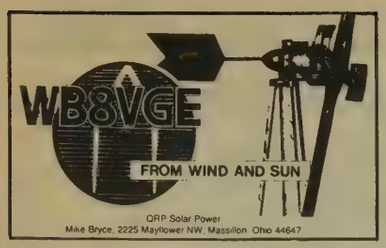
Most dual-banders let you listen to two frequencies at once. It can really be handy to listen to a 2 meter and a 440 MHz repeater at the same time. But many new models also let you listen to two frequencies on the *same* band. How cool can you get?

The Smallest Repeater

Have you ever thought about having your own repeater? Why, you ask, would you want that? Well, usually, you don't, of course. But sometimes it can be handy to have a portable repeater. Let's say you're working a public service or emergency event and you can't get a signal to the real repeater, due to geography or obstructions. If you had your own portable repeater, you could use it as a gateway to the big one.

Normally, the antenna duplexing problem (avoiding trashing of the repeater's receiver by its own transmitter) requires large filters or separate antennas with considerable distance between them. Heck, even with a 600 kHz offset, it's hard to keep all that transmitter energy out of the receiver. But what if the two frequencies are on different *bands*? Then, they really won't bother each other! Consequently, many new dual-band rigs offer a crossband repeat function, wherein they will automatically retransmit whatever comes in on one band on the other band. Essentially, these rigs are miniature repeaters. Mobile radios have had this feature for a few years, but it has now come to walkies as well. I don't know how useful it is in such a small radio, but I suppose it could be fun to experiment with.

Well, I think we've covered most of the useful features available on modern walkies. Some rigs have even more gadgets, such as VOX (voice-operated transmit switching with a headset), clocks and timers, but they are strictly a matter of preference; you don't need them to do the job. If you're in the market for a new HT, try to pick one that you find easy to operate and generally appealing. As long as it has memories and CTCSS, you should wind up being happy. One more thing: I find that rigs with fewer buttons are *harder* to use, not easier, because they have to cram more functions into fewer controls. The result is arcane, hard-to-remember keypress sequences. The fewer functions assigned to each key, the better. 73 and see you all next time, from KB1UM. RF



radio magic

by Michael Bryce WB8VGE

After 12 years of dependable service, my old Heathkit oscilloscope died just when I needed it. Since this piece of gear is rather old and outdated, I thought I'd just put its remains in the junk box and buy a new one. Whoa! Did I ever get a surprise. A new scope with all the digital storage and quad channels would cost over three grand. Maybe I should take a look at my old scope and see what went wrong. So with a goal of saving myself a pile of money, I took the covers off the Heathkit and jumped in. This is a good reason why hams keep a well-stocked junk box.

What's Wrong?

The baseline trace would not come up to the center of the scope, no matter what I did. The baseline trace is the trace displayed on the scope with no input to either vertical amplifier. It's just a solid line across the face of the tube. Since my scope has two channels, I tried the other one as well. It showed the same fault as the first channel.

What's Right

Right from the start, we know several important items about this piece of gear. Let's take a closer look at what we know is working:

We know the high voltage power supply is working because we do have a trace across the face of the scope. This means the 2 kV supply is working. Just like a TV set, the scope needs this high potential to attract the electron beam to its face.

The time base is working. By adjusting the sweep time controls, we can vary the speed of the trace across the face of the tube. This also means the low voltage power supplies are working correctly. The sweep circuits would not work without the correct voltage.

The focus, intensity and horizontal position controls all work. Again, this means the CRT tube and its support voltages must be in working order.

Both channels are working, although neither can be moved into the proper location on the CRT. Since both channels do work, the switching between the two must also be working.

The autotrigger function is operating.

Common Troubles

One of the first lessons in troubleshooting is getting all your ducks lined up in a row. I've eliminated 90 percent of the scope as the source of the problem by just placing the known good circuits out of the way. Now we can narrow things down to one stage, perhaps two. There's no need to even look at the 2 kV supply test points; we know it's there because we see a trace line.

One thing's for sure: Whatever the problem is, it affects both channels. Therefore, the culprit must be common to both. Since I can't move the screen up or vertically, the first place to start looking for trouble is in the vertical amplifier circuits.

Voltage Checks

After I opened up the case, the first thing I did was check all of the low-voltage supplies. This scope requires +5, -15, +15 volts. A quick check with the DVM confirmed that all voltages were within specifications. I checked for each voltage again on the vertical amplifier board, just in case *loose wire* stopped things cold. Of course, I found no loose wires and the correct voltages appeared on the vertical amplifier board.

The next step consisted of going over the amplifier board looking for signs of burnt-up components. When a resistor cooks, it leaves a black greasy spot on a PC board. Since I know the trouble to be common with both channels, I started to look at the part of the vertical amplifier that drives the deflection plates of the CRT. Since both channels control only one set of deflection plates, the trouble had to be in this area.

Small-value resistors (100 ohms and lower) are prone to cook long before a higher value resistor will. So, I started to give each low-value resistor a good visual check for signs of damage. Also, I checked very closely all high wattage resistors for signs of damage.

I found what I was looking for under a 10 ohm 1/2 watt resistor: a burnt spot on the PC board. Tracing out the circuit, the resistor feeds -15 volts to a 2N3555 transistor. This transistor in turn controls the gain of a 2N6592, which controls the vertical deflection plates.

The voltage on the 2N6592's collector is supposed to be +180 volts; that varies as you adjust the position control. There are two 2N6592s: one for the top vertical plate and the other for the bottom vertical plate. By moving the position control, I found the voltage on one to change on the collector, just as it should. The other one did not move—the voltage remained the same. Both of the 2N6592 transistors are mounted on huge heat sinks.

Cold Nose

A cold nose on a dog may be a good sign, but not in this case. As my first law of thermal dynamics states, *the larger the heat sink, the hotter it must be.* In the case of my scope, one heat sink is quite hot; the other is stone cold. That's the problem. Either the transistor is not being turned on, is opened, or a resistor in its emitter lead has opened up. The only way to tell is to remove the transistor and see if it's fried.

Which brings us back to the 10 ohm resistor. Why did it cook? Well, it looks like the 2N6592 may have gone short, pulling down the -15 volt supply. The 10 ohm resistor feeds this supply to the 2N6592s, so a shorted transistor would pull the supply to ground, causing excessive current to flow through the resistor, causing it to cook.

The Fix

The 2N6592 did in fact prove to be open. All I have to do now is install a new transistor and a resistor and we'll be back in business. This is where we'll pick up next month.

Next month we start a new year with *Radio Fun.* If you have been enjoying "Radio Magic," let the editors know. If there is something you'd like me to discuss, shoot a note to me. I'm available via good ol' US mail, CompuServe ID # 73357,222 or America Online at Michae1087. Hope to hear from you. RF

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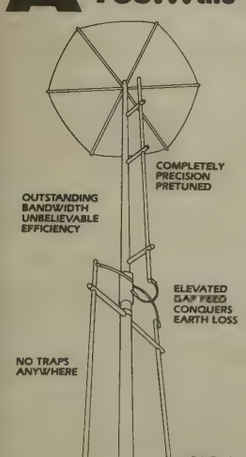

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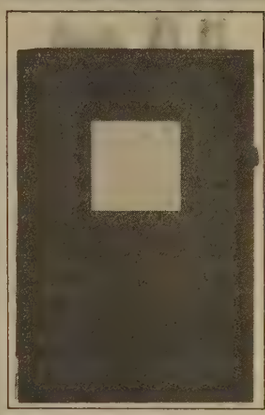

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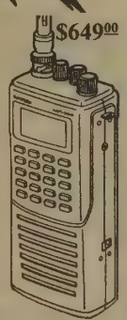

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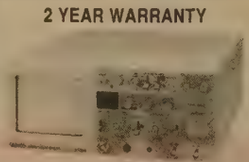

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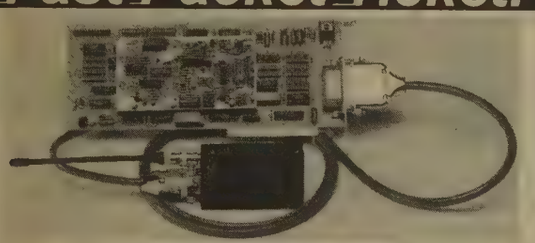

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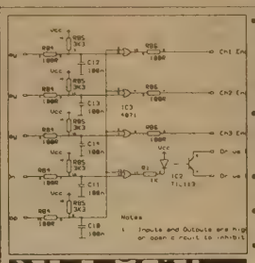

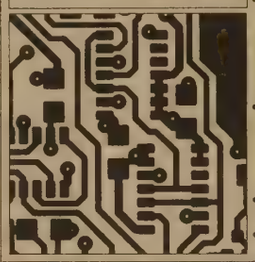

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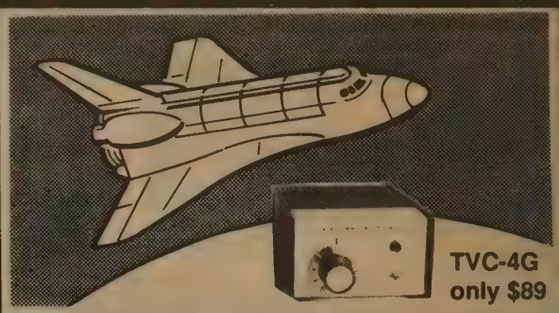

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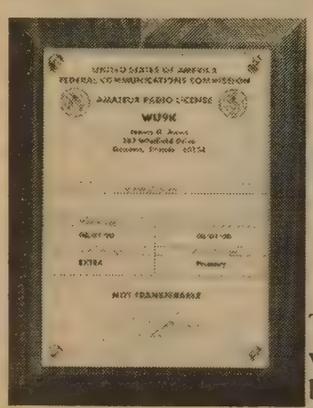

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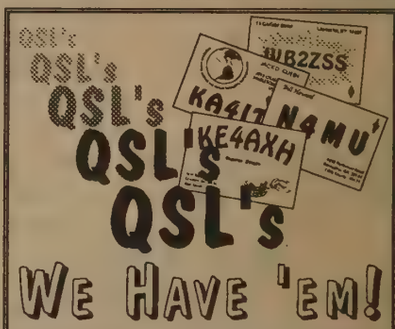

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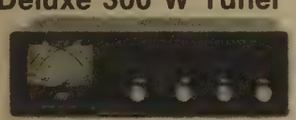

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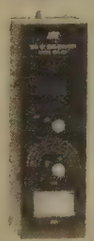

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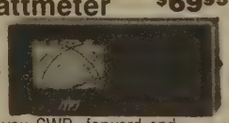

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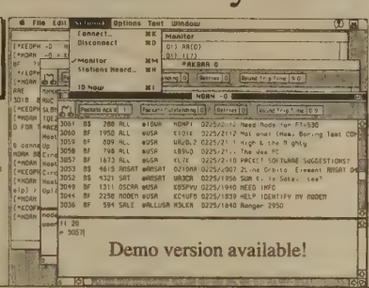

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antennas, etc.

by Joseph J. Carr K4IPV

Connectors, Adapters and All That Stuff

The basement of my house is filled with assorted electronic equipment. And while it doesn't exactly cover frequencies from DC to daylight (it does go from DC to microwave), there are a lot of different types of equipment that do many different jobs and operate on a wide variety of frequencies. The equipment was bought new, bought surplus from dealers like Fair Radio Sales (Lima, OH), traded for other goodies, bought "as-is" from hamfest tailgaters, and some was even given to me by people who no longer needed it or were unable to fix it themselves. One piece of equipment I even found on a trash pile on pick-up day, and still another was bought at a yard sale. One word characterizes my collection of electronic equipment: variety.

Variety is the spice of life, says the old proverb . . . or is it? Sometimes, variety can result in hair-pulling frustration; "Daddy's inventing new cuss words" has been heard around my house more than once. Why? Because of the wide variety of connectors used on the assorted equipment I own (sigh).

Photos A and B show a small collection of connectors and adapters from my workbench. The adapters are used to match odd connectors to each other. Photo A shows two male coaxial connectors attached to wire. The large PL-259 UHF connector on the left is the standard for most ham rigs other than hand-held units. It will take power levels from noise-level QRP to the maximum ham legal limit. It mates with the SO-239 chassis-mounted coaxial connector.

Right next to it is the BNC coaxial connector. It is also sometimes called the "constant impedance" connector because it provides minimal disruption to the system impedance. There are both cable-end versions (as shown) and chassis-mount types. The BNC connector is commonly used on hand-held transceivers, most modern test equipment, and other places. Most signal generators and oscilloscopes on the market today are equipped with BNC connectors. You will sometimes see BNC chassis-mounted connectors with a small rubber O-ring around them. These are "high altitude" or "pressure-proof" connectors. The rubber O-ring seals the joint between the connector and the chassis for gas leakage.

The two cable ends shown in Photo A are the banana plug and the alligator clip. These connectors are for single conductors. The banana plug fits into five-way binding posts. Also, note that it also fits into the center conductor point on the SO-239 UHF chassis connector. The alligator clip will fit into or onto anything that the jaws can grasp. Neither of these connectors are intended for transmitting antennas, although I've seen QRP antenna tuners for random-length wire antennas use the banana plug and binding post method.

Former ARRL president Vic Clark W4KFC was a champion contester. In the 1960s he and a few others traded places from time to time for top honors in the ARRL sweepstakes, the DX contest and other radio slugfests. He once told a bunch of us after a radio club meeting that he needed a pair of alligator clip leads to temporarily lash some things together. Blaming a family member (who was also a ham, I believe), he was taken aback when told that all the alligator clip leads were inside his transmitter and final amplifier where they had been (for years) used to make emergency repairs during contests (sweepstakes are pretty intense, I recall).

Photo A shows two adapters. One is a right-angle SO-239-to-PL-259 adapter. It is used to rotate a connection point 90 degrees. I've used these adapters to better position VSWR meters on top of a transceiver, to allow the rig to sit closer to the wall at the back of a desk, and for many other applications. The other adapter is a BNC-to-PL-259 adapter. It allows you to connect a BNC cable to an instrument or rig that has an SO-239 UHF connector (which normally mates with the PL-259).

Several other adapters from my workbench collection are shown in Photo B. The shiny connector on the left is a homebrew connector that converts BNC to the RCA phono jack. I've seen several instruments recently that used the RCA phono jack as a cost-saving measure, and indeed have used them myself for exactly the same reason. Right next to the homebrew connector is a BNC Tee connector. It allows a BNC cable to be split into two directions. The black two-pronged connector is used convert a binding post pair to BNC. Many older instruments, as well as some modern instruments used in the audio frequency range, are equipped with a pair of binding posts spaced 0.750 inches apart center to center. They do not mate with coaxial cables used on other instruments. This adapter takes care of that little problem.

The other two adapters shown in Photo B are Type-N connectors. The Type-N connector is used a lot on commercial and military RF equipment. It is similar to the PL-259/SO0239 style of connector except that it has a shielded inner conductor pin.

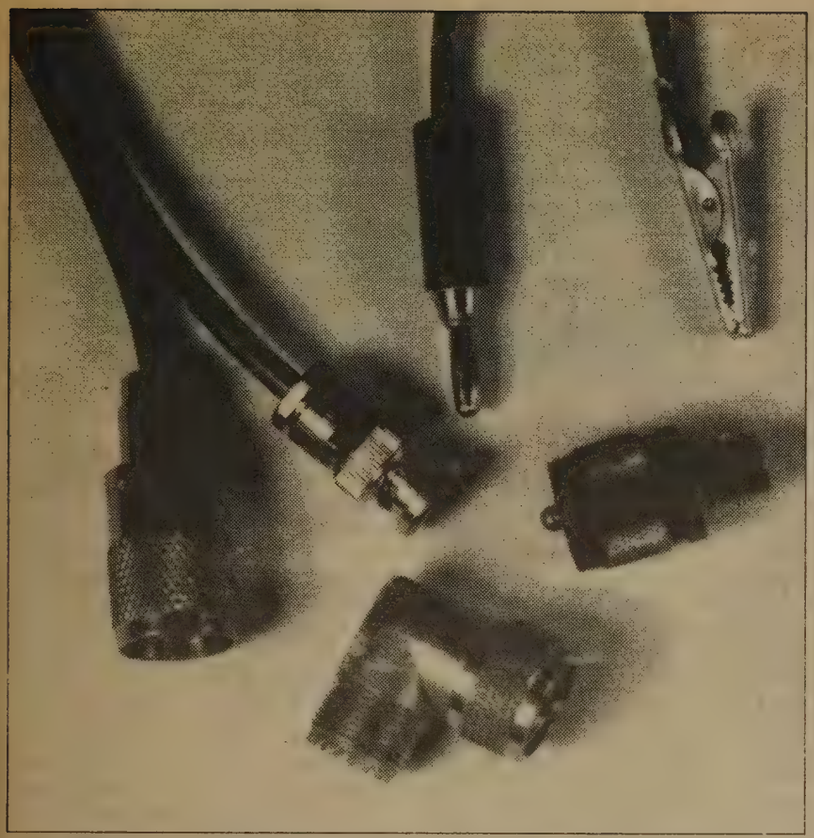

Photo A. Assortment of connectors from the author's collection.

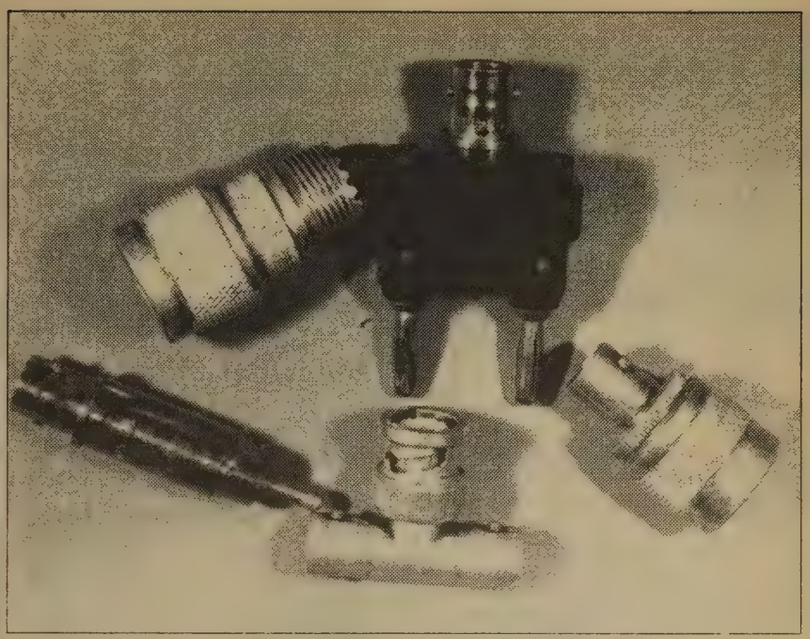

Photo B. Assortment of RF adapters.

Not too long ago I bought a multi-stage precision step attenuator. It was new, but carried a "close-out" price at a local ham outlet. The reason for the low price was that it was fitted with Type-N connectors rather than the more popular BNC or SO-239. While the Type-N is more expensive than either BNC or SO-239, it is not popular with hams so the price in a ham store was lower. A pair of BNC-to-Type-N adapters, similar to that in the lower right of Photo B, solved the problem neatly. The other Type-N adapter shown in Photo B (upper left) is an SO-239-to-Type-N, which allows connecting ordinary PL-259 coaxial connectors to an instrument with a Type-N connector.

Some adapters are very costly, while others fall into the "decimal dust" category ($2-$4). Whenever I have a few extra bucks I pick up a few new or different adapters. Having multiple adapters of each type, and many different types, makes it more likely that a particular situation can be serviced. Indeed, you would laugh heartily if you saw some of the multi-adapter lash-ups that have appeared on my workbench . . . all because of the oddball variety of test and ham equipment I've accumulated over the decades.

The Antlers Software

The Antlers program allows you to calculate the length of antenna elements without knowing the formula. It covers dipoles, most other popular wire antennas, the major types of verticals, yagi and quad beams, and radio direction finding loop antennas as well. For information about getting copies of Antlers, write to me at P.O. Box 1099, Falls Church, VA 22041. An MS-DOS or Windows (i.e. IBM compatible) machine equipped with a color monitor is required. RF

upgrade . . . don't stop now

by Gordon West WB6NOA

12 Volts DC on the Bench

When you run your amateur radio equipment at home, most ham transceivers will require 12 volts DC. The very large and heavy worldwide high frequency sets are an exception, but most medium- and small-sized ham sets run only on 12 volts DC.

To run your mobile equipment at home from 12 volts DC is relatively easy if you choose your power source carefully. Keep in mind that personal safety, including protection from fire hazards, should be your first consideration. This is why I don't usually recommend taking a car battery, sticking it under your operating console, and periodically charging your system with a little automobile battery charger. Running equipment from an automobile battery is easy, but hazardous. An accidental short between the two battery posts could cause a fire. Normal charging gives off gases that should not be inhaled. Battery acid often will bubble out and could be fatal to any pets that might take a lick.

Here in Southern California where earthquakes and power outages run hand in hand, I *do* run my 12 volt DC equipment with big storage batteries, but the batteries are safely outside. There are multiple fuses throughout the 12 volt DC system, and I run everything through an instrument panel that allows me to monitor how well my rooftop solar cells are keeping up with power demands. If you're going to run a battery, that's the way to do it.

Never attempt to run any type of 12 volt DC equipment directly from a big automobile battery charger. These battery chargers put out a tremendous AC component that would instantly wipe out any piece of equipment hooked up directly.

Two major power supply companies provide an alternative to dragging in a big battery from your car to run your equipment:

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These companies are recognized leaders in providing professional power supplies for commercial and amateur radio use. The power supplies each put out 13.6 volts DC, contain less than 8 millivolts (RMS) AC ripple, and feature current limiting that will automatically shut down if you draw too much current. The supply will also cycle down if it gets too hot, and it will snap off instantly if you should accidentally short the 12 volt DC leads.

The power supplies from Newmar and Astron feature heavy-duty power transformers to change 110 VAC over to 12 volts. Extremely large filter capacitors and a diode network take out the AC component to give you a pure DC flow for your mobile equipment in the shack. In fact, the modern power supply probably gives a more pure DC source than an outside battery system attached to an operating automobile battery charger.

But you don't necessarily need a big heavy transformer inside a power supply to take 110 volts AC down to 12 volts DC. Equipment manufacturers may offer "switcher" power supplies that are so lightweight you might think there's nothing inside these tiny units. All of the voltage conversion and rectification is done by fast-switching transistors. The output voltage is extremely clean, so if you travel around the country and need a reliable 12 volt DC source, consider a "switcher" supply.

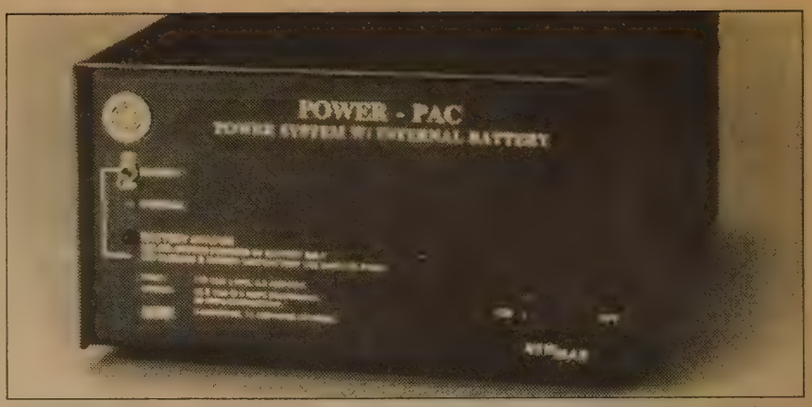

Photo A. This Newmar power supply has a built-in battery in case of AC power line failure.

But there is a drawback to the switcher supply: the inherent RF noise it can emit within its immediate vicinity. If you are running an outside antenna, this noise will not be a problem. But if you're running a lot of other equipment with antennas close to the switcher power supply, this noise can be a nuisance.

Another consideration with "switcher" power supplies is their unforgiving nature. An input voltage transient could wipe out the transistors in an instant. And when a "switcher" goes, it could very well take out your transceiver too, thanks to renegade AC jumping onto the DC line.

Also, most manufacturers rate their switcher power supply only for their particular piece of equipment, and may not give you additional connections for adding on other radio sets. Something to think about.

If you need a variable power supply, both Astron and Newmar have models with volt and amp meters, just for this purpose. I like a meter on the power supply to let me know how much current my set is pulling. You can tell a lot about how your equipment is performing by its current consumption.

And how much current will you need for your ham transceiver? Here's a simple guide:

Worldwide SSB HF transceiver	30 amps
Worldwide HF transceiver, short transmission times	20 amps
50 watt single-band and dual-band mobile units	12 amps
10 watt VHF/UHF mobile unit	6 amps
Hand-held transceiver off of external 12 VDC	2 amps

Note: *Watch out for those amperage ratings!* Many power supplies are rated for intermittent duty, and this is about twice what they will do under continuous duty. For SSB transceivers, 20 amps intermittent would probably keep up with some transmitting and a lot of listening. But if you do a ton of talking, or operate RTTY or SSTV, better go for the 30 amp power supply that should give you at least 20 amps continuous.

For FM transceivers, the 12 amp intermittent supplies normally give you at least 7 amps continuous output, and this is plenty for most rigs up to 45 watts output. Little hand-held transceivers rarely pull more than 1 amp, so a 2 amp intermittent supply should do just fine.

Caution: Don't attempt to use CB radio power supplies on anything other than a hand-held transceiver. I have often seen CB-type power supplies trying to run a 45 watt dual-band mobile rig, and the operators can't figure out why they are receiving lousy signal reports. CB power supplies don't supply enough current to properly drive mobile 40 watt or even 25 watt rigs.

Finally, every so often feel the metal case of the power supply as you are running your equipment. It's going to get warm if you do a lot of transmitting, but should not get too hot to touch. If it is hot enough to cook on, you may need to think about the next size up power supply. On a temporary basis, take a muffin fan and pull air up through the rear heat sinks to dramatically cool off the fins. You wouldn't believe what a big difference a little fan makes—but remember, don't blow air down on it, but rather pull air up through it and out.

Have fun running your 12 volt DC equipment off of home power with the use of a professional power supply. Write these manufacturers for a catalog of what they offer. RF

Photo B. The bench power supply may also offer a cigarette plug adapter for 12 VDC.

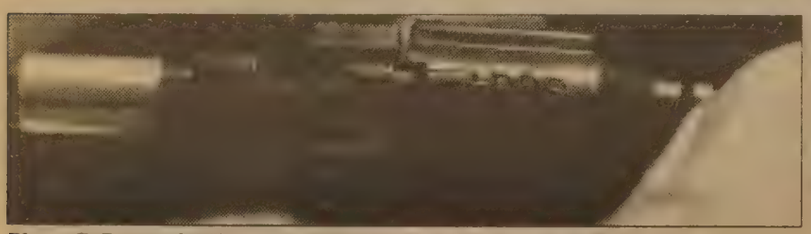

Photo C. Be careful if you run your handheld from your 12 VDC power supply.

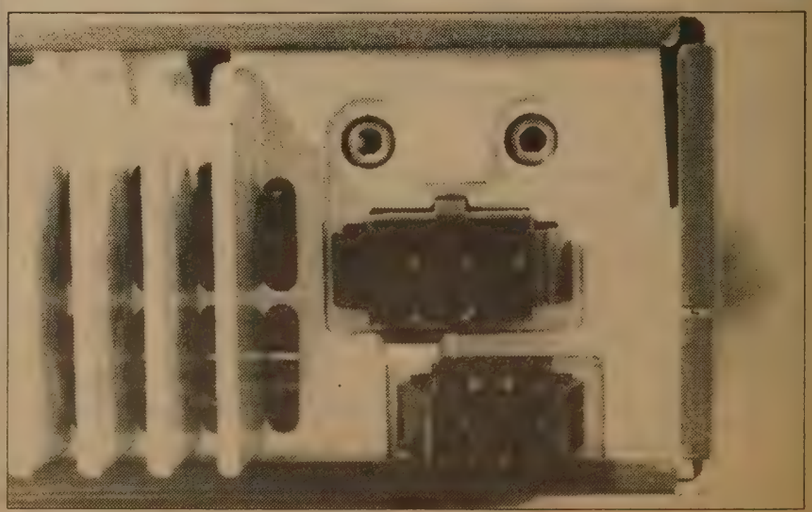

Photo D. You may need to purchase a second power cord to run your equipment at home.

what's next?

by Carole Perry WB2MGP

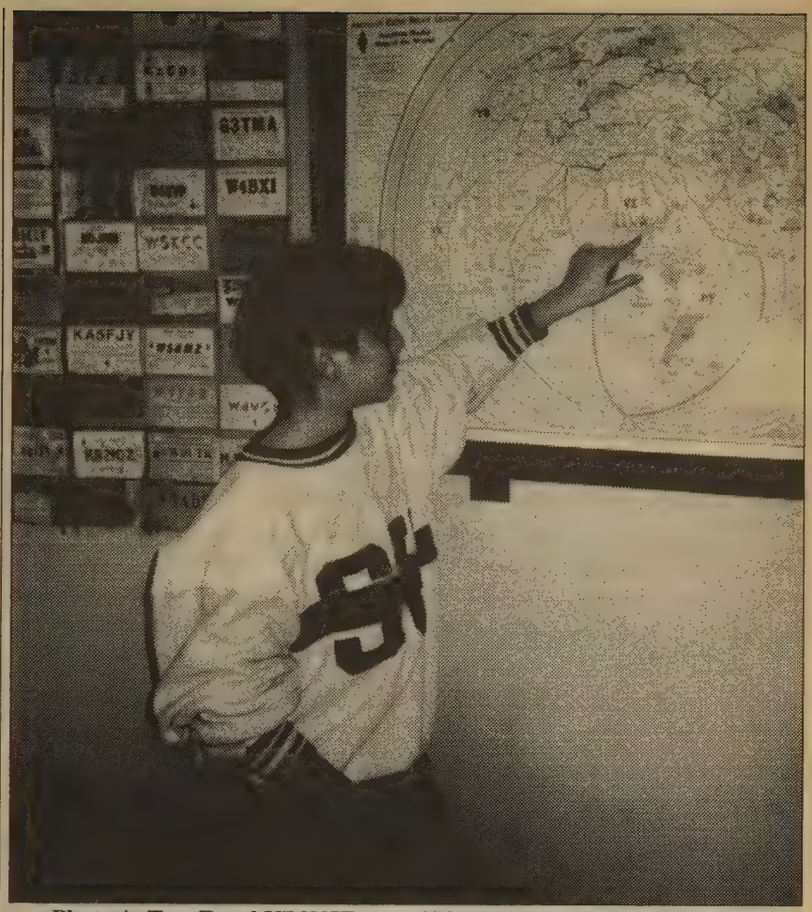

Photo A. Tom Engel KB2NJZ, now 4Z9HBL (he is a student who has returned to Israel), doing research for a geography lesson.

Food for Thought

For the past several years we have had great fun in ham radio class doing projects that celebrate the importance of National Geography Awareness Week. This year my 7th and 8th grade radio classes decided to create a papier-mâché globe which they would fill in with foods, spices and grains indigenous to the area. My 6th graders chose to make a huge map of the United States on brown butcher paper and fill it in with the appropriate foodstuff.

November 14 to 20 was the target week for the project. Since many of my students at Intermediate School 72 in Staten Island, New York, are from families that have recently moved to the borough from other parts of the world, we turned to the children's own families as resources. The parents were delighted to help their children locate specific spices or grains that represented the area on the globe they had come from.

Of course, the obvious resource we also turned to was the radio. Whenever we made a contact with a citizen of a region that we still needed help with, the kids would interview the ham radio operator and enlist his help. I knew I was on the right track with this project when one of the children said, "It's a lot more fun to talk directly to someone to get information than to look up facts in some yucky textbook."

The CQ All Schools Net provided us with a wealth of information. On Tuesdays and Thursdays at 12:30 Eastern time we convene on 28.303 MHz to encourage youngsters all across the country to get on the radio and talk with each other school-to-school. If nothing is heard after 10 minutes you can listen for us on 21.325 MHz and after 10 minutes on 14.325. If you don't hear my kids under the WB2MGP call, listen for Gordon West WB6NOA on Tuesdays from California or for Jim N4MDC from Louisiana; these are our other net controls.

As always, the nice folks who check into the net to speak with the children are extremely supportive of our educational efforts. In preparing our globe project, we've been receiving foodstuff from all over the world. Not only was this a great geography awareness project for the kids, but they also got to see what a valuable resource the ham radio could be.

I thought that last year's pumpkin globe project was a bit messy in my room—especially when the painted pumpkins began to decompose. The mess involved with the papier-mâché put the other project to shame. I definitely suggest that you get your clean-up squad well organized before you attempt this one. I was stepping on peas and seeds for weeks. I eventually wound up breaking the group into teams. I appointed a glue squad who were responsible for the *neat* gluing of the grains, spices and food samples on the globe and on the floor map. Another team was responsible for the proper labeling and storing of the perishable items. I did class lessons for all the students to verify the accuracy of the items we were collecting. By the third week, my ham shack looked like it was inside a food warehouse.

Because of previous lessons we'd had in ham radio class, my 7th and 8th graders knew about writing to foreign embassies to get more information. It was very gratifying to see some of last year's licensed youngsters so at ease with some of the more sophisticated techniques they learned in radio class. I was very proud of them.

The large paper map of the United States was a little easier to control because I insisted the kids use crayons or magic markers instead of paint. They were creative enough to figure out themselves that as the deadline drew near, it was acceptable to draw a small illustration or write in the names of the grain or spice they weren't able to locate. As of the writing of this column, both the globe and the map are approximately 90% filled in with actual substances.

It didn't take long for some of my 8th graders to come up with some delightful puns while explaining our project on the air. They would tell other operators that they were engaged in a very "tasteful" geography project or that their teacher was giving them some "food for thought."

The children definitely become worldly when immersed in these fun geography lessons that are a natural outcome of talking on the radio. The world is indeed becoming smaller, and ham radio is the perfect tool to bring the world into the classroom. If you are a teacher of social studies and/or geography, you owe it to your students to introduce an exciting lesson for National Geography Awareness Week and to coordinate it with live contacts on the air.

If you have had success with innovative geography lessons, please write to me so we can showcase your work and share the ideas with other instructors: Carole Perry, P.O. Box 131646, Staten Island NY 10313-0006. RF

Simple N Connector

by Gordon West WB6NOA

At most major weekend hamfests, you will spot a 20- to 30-foot booth full of antenna connectors and all sorts of coax. It's called "The Radio Works," and it's run by Jim Thompson W4THU (Box 6159, Portsmouth VA 23703; 804/484-0140).

Their latest product is a simple N connector for those antenna connections at 440 MHz and 1.2 GHz. More and more amateur radio transceiver manufacturers are going to the N connection for minimum loss at UHF frequencies. Most new hams give up trying to figure out how to do an N connector because of the several parts that must be assembled with specific steps in the process.

The simple N connector features a Teflon dielectric, silver-plating on the actual connector, and gold-plating on the pin. One size fits all, including RG8, RG-213, 9913, and 9086 semi-rigid coax. Simply cut clean the end of your coax, trim off about 1/4-inch of the jacket, and slightly trim back the inner dielectric. Attach the easy N connector and solder the center conductor through the little hole in the gold-plated center pin, then solder the braid through two holes on the outside sleeve. Now screw on the outside barrel part of the connector and you are on the air. Just as simple (if not easier) than a common PL-259 connector.

Quit using those PL-to-N adapters. Go with this new connector, available for around $3.25, and do it right. It works great. RF

N-200 "N" Connector Specifications

Fits cables	9913, 9086, RG-213 and similar coaxial cable
Dielectric	Teflon
Plating	Silver
Pin	Gold
Max frequency	>2.5 GHz
Price class	$3.25

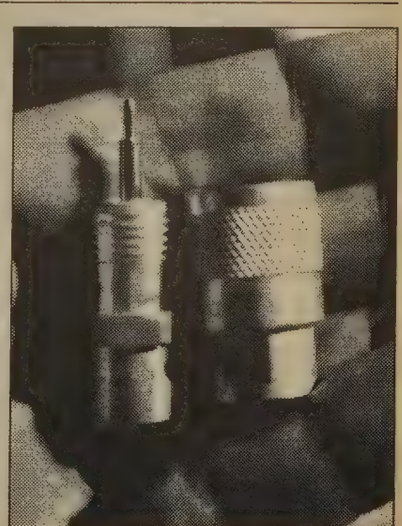

Photo A. The Radio Works' N-200 "N" connector for beginners.

Radio Fun flea market

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 30,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar, and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *Radio Fun Flea Market* costs you peanuts (almost)—comes to 25 cents a word for individual (noncommercial) ads, and 80 cents a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad. This is a monthly magazine, not a daily newspaper, so figure a couple of months before the action starts; then be prepared. If you get too many calls, you priced it too low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right, and maybe you can help make a ham newcomer or retired old-timer happy with that rig you're not using.

Send your ads and payment to *Radio Fun Flea Market*, Judy Walker, 70 Route 202 N, Peterborough NH 03458, and *get set for the phone calls.*

The Deadline for the January 1994 Flea Market is November 12, 1993.

SENSATIONAL NEW WAY TO LEARN CODE-Do Aerobics, Sing, Jog, or **Drive** while learning code! **Now** the secret is yours! Order **THE RHYTHM OF THE CODE-Morse** code music cassette today! $9.95 ppd **KAWA RECORDS**, P.O. Box 319-R, Weymouth MA 02188. The **HIT** of the 1993 Dayton Hamvention! RF247

MINIATURE POLICE RADAR TRANSMITTER one mile range, $41 assembled, $31 kit, (219)489-1711. P.O. Box 80096, Fort Wayne IN 46898. RF251

WANTED: Manual for National NC 190 Receiver. N3OTQ, 1 Woodland Dr., Troy PA 16947. RF255

AMIGA, MACINTOSH, ATARI XL/XE/ST Amateur Radio PD Software $4.00 disk. Two-stamp SASE brings catalog. Specify computer!

KINETIC DESIGNS HAMWARE Box 1646, Orange Park FL 32067-1646. RF266

QSL SAMPLES- 50 cents. **SAMCARDS,** 48 Monte Carlo Dr., Pittsburgh PA 15239.RF275

VHF, UHF, QUAD 4+ ELEMENTS: Parts list and assembly instructions for easy construction. Send $10 and SASE, **TODD KI6JE,** MB# 1029, Ridge Park Drive, Concord CA 94518.RF285

WANTED: 4 pin tubes 211/VTA4C, 845, 2A3, etc. Garrard 301, 401, **SME RMA**, 309, 3012 Arms Ortofon SPU. Oil Caps. Call (201)751-5959. Paul Gil, 180 Union Ave., Belleville NJ 07109. RF320

IBM SHAREWARE! Huge selection! $1.00 Disk! $.35 Specials! Catalog $1.00. **PMA-RF,** Box 2424, Scottsdale AZ 85252. RF360

CUSTOM MADE-HAND TOOLED Leather products with your initials, name, call letters. Photo's & estimates available. Key rings, wallets, belts, purses, hanging signs, specialty items. Great X-Mas gift. **LEATHER & WEST,** 67 Causeway Rd., West Swanzey NH 03469. (603)352-6256. 9-4 pm. M-F ET. RF370

CLEANING SHACK. Want my list? **LEWALSKI,** 3512 Moraga Blvd +4103, Lafayette GA 94549. RF470

BROWNIES QSL CARDS since 1939. Catalog and Samples $1 (refundable with order). 3035 Lehigh Street, Allentown PA 18103. RF475

KIT BUILDERS! Complete list of 150 + kit vendors. #10 SASE + $3 USD to: **RUTENBER ENGINEERING**, 38045 10th St. E. #H75-RF, Palmdale CA 93550-RF. RF485

YAESU 60 1.6-60 MHz, new, $125.00; **MFJ** 949-D Deluxe 300 Watts, tuner, new, $125.00; QSYer for 757 **YAESU,** used, $70.00; DX160 Realistic Receiver, regulated output, 13.8VDC, $10.00. **ED KE4CAF,** phone (615)331-4624. RF490

INEXPENSIVE HAM EQUIPMENT. Send stamp for list. **WA4DSO,** 3037 Audrey Drive, Gastonia NC 28054. RF559

RADIO ASTRONOMY. For information: Write **"SOCIETY OF AMATEUR RADIO ASTRONOMERS,"** Vincent Caracci, 247 N. Linden St., Massapequa NY 11758. RF580

PRINTED CIRCUIT BOARDS for *73 Magazine, QST, ARRL Electronics Now, Nuts & Volts,* projects. U.S. orders deduct 20%. Free list. **B-C-D ELECTRONICS,** Box 20304, 858 Upper James St., Hamilton, Ontario, Canada L9C 7M5. RF585

PRINTED CIRCUIT BOARDS for projects in *73, Ham Radio, QST, ARRL Handbook.* List, SASE. **FAR CIRCUITS,** 18N640 Field Ct., Dundee IL 60118. RF595

VIDEO SYNC GENERATOR Restores horizontal & vertical sync lines from distorted analogue video formats. For information on completed units & pricing, write: **R.C. DISTRIBUTING,** Box 552, South Bend IN 46624. Phone: (219)236-5776. RF610

THE MODULATORS MATCH RADIO TO AMP. All kits will greatly increase your modulation while suppressing the carrier. GRANDMA MOD fits RCI2950. GRANDPA MOD fits HR2510. ONLY $19.95 ea. (800)536-0109. Dave. RF615

WANTED: BUY & SELL All types of Electron Tubes. Call (612)429-9397, Fax (612)429-0929. **C & N ELECTRONICS,** Harold Bramstedt, 6104 Egg Lake Road, Hugo MN 55038. RF620

INTERESTED IN PUBLIC SERVICE? Join REACT TODAY! For information write, **KA3PDQ, c/o REACT,** P.O. Box 8797, Allentown PA 18105. RF630

VHF-UHF-SHF Large SASE. **VHFer** P.O. Box #685, Holbrook AZ 86025. RF660

RADIO TRANSCRIPTION DISCS WANTED. W7F1Z, Box 724, Redmond, WA 98073-0274. RF700

9 1/2 INCH UTC WALL CLOCK- $26.50 ppd. **GABAY TOOL CO.,** P.O. Box 68, Necedah WI 54646. RF705

WANTED: 1930-1965 AUDIO EQUIPMENT, amplifiers, tubes, speakers, etc. Western Electric, Marantz, McIntosh, Etc. Call toll free (800)251-5454. RF835

FREE Ham Gospel Tracts. SASE. **N3FTT,** 5133 Gramercy, Clifton Heights PA 19018. RF960

CONNECTICUT'S favorite ham store. **ROGUS ELECTRONICS,** 250 Meriden-Waterbury Turnpike, Southington CT 06489. (203)621-2252. RF994

SECRET SCANNER Frequencies: Federal, Police, Aero, Military, Cellular, Surveillance, also SWL & CB Books. Big FREE catalog! **CRB RESEARCH,** Box 56-RF, Commack NY 11725. RF996

activities calendar

Send your announcements to: Radio Fun Activities Calendar, 70 Route 202-N, Peterborough NH 03458. We'll print as many as space allows, on a "first come-first listed" basis.

DEC 4

FARIBAULT, MN The annual Courage Center Handi-Ham Winter Hamfest will be held at the Eagles Club, starting with registration at 8:30 AM. Flea Market. Handi-Ham Equipment Auction. Talk-in on 19/79. Contact *Don Franz W0FIT, 1114 Frank Ave., Albert Lea MN 56007.*

DEC 5

HAZEL PARK, MI The Hazel Park ARC will hold its 28th annual Swap and Shop, from 8 AM-2 PM, at Hazel Park High School, 23400 Hughes St. Talk-in on 146.64- (DART). Contact *HPARC, Box 368, Hazel Park MI 48030.*

SPECIAL EVENT STATIONS

DEC 3-5

SAN ANGELO, TX The San Angelo ARC will operate Station W5QX to celebrate Christmas at Old Fort Concho, from 0001Z Dec.3rd-2000Z Dec. 5th. Frequencies: Lower General portions of 40, 20 and 10 meters. For a certificate, send QSL with contact number and a 9 x 12 SASE to: *W5QX, P.O. Box 4002, San Angelo TX 76902.*

DEC 4

FLINT, MI The Genesee County RC will operate W8ACW 1200Z-2400Z, to celebrate their 60th Anniversary. Operation will be in the General 80-15 meter phone subbands, the Novice 10 meter phone subband, and 2 meters. For QSL, send QSL and SASE to *GCRC, P.O. Box 485, Flint MI 48501.*

KALAUPAPA, HI Kalawao County will be on the air, with several SE Stations operating from the site of the Hansen's Disease Hospital, and the historic lighthouse. Phone, CW, and digital activities are planned for all bands, including the Novice subbands. Look for us at the lower portion of each subband. Listen for AH6IO, AH6IN, AH6KY, AH6KX, and others. For a commemorative QSL card, please send your card and an SASE to the home address of the operator contacted.

DEC 11

HOLLY, MI The Fenton Area ARA will operate KB8MBJ 1400Z-2400Z, during the annual Charles Dickens Festival. Operations will take place between 28.300/.500 MHz and in the General portions of the 20 and 40 meter phone subbands. For a special card, send your QSL and #10 SASE to *Bill Coale KB8MBJ, 605 S. Broad St., Holly MI 48442.*

DEC 11-12

TROY, NY The Troy ARA announces its 2nd annual RTTY Sprint. The contest period this year will be from 2100 UTC Dec. 11th-0100 UTC Dec. 12th. Scoring and bands will be the same as the ARRL RTTY Roundup. Logs should be submitted by Jan. 17th, 1994 to *Bill Eddy NY2U, c/o TARA, 2204 22nd St., Troy NY 12180.*

DEC 18

PERRIS, CA Hams of the Orange Empire Railway Museum will operate KC6TKT and other calls 1900Z-2359Z, to celebrate their annual North Pole Limited Steam Train operation. SSB: 28.330 MHz. For QSL, send QSL and #9 SASE to *OERM, P.O. Box 548, Perris CA 92572-0548.*

DEC 18-19

NAZARETH, PA The Delaware-Lehigh ARC will operate W3OK 1400Z-0200Z Dec. 18-19, from the twin Christmas cities of Nazareth and Bethlehem PA. Frequencies: 3.965, 7.265, 14.265, 21.365, 28.365. For a certificate, send QSL and SASE to *DLARC, RD4, Greystone Bldg., Nazareth PA 18064.*

DEC 30-JAN 1

PASADENA, CA The Relay Repeater Club will operate Station WB6BNJ from the Wrigley Mansion. Dec. 30th-Jan. 1st, from 1600Z-0200Z each day. Primary frequency will be 28.460 MHz. Secondary frequencies: 21.335 MHz and 14.260 MHz. This event is in conjunction with the 105th Anniversary of the Tournament of Roses. Amateurs in California/Nevada can contact the Station on 2 meters through the 147.21 repeater, on the half hour, or on 220 MHz (via the Condor Connection) on the hour. For a certificate, send a QSL, with contact number and a 9 x 12 SASE with 58 cents postage, to *Relay Repeater Club, P.O. Box 660081, Arcadia CA 91066-0081.*

Uncle Wayne's Bookshelf

BOOKS FOR BEGINNERS

02D42 **Digital Novice** *by Jim Grubbs* Geared to make you a more knowledgable participant. **$8.50**

01A87 **Shortwave Listener's Antenna Handbook** Primer antenna theory. **$13.95**

05C25 **Basic A.C. Circuits** A step-by-step approach for the beginning student. **$24.50**

20N018 **Technician Class License Manual: New No-Code** *by Gordon West* This book covers everything you need to become a Technician Class Ham. Every question and answer on the examinations is found in this one book. FCC Form 610 application. **$9.95**

20N092 **The Wonderful World of Ham Radio** *by Richard Skolnik, KB4LCS* Simple, clear, and fun. Introduces young people to amateur radio. **$7.95**

20N100 **Electronics Build and Learn (2nd Ed.)** *by RA Penfold* Combines theory and practice so that you can "learn by doing." **$12.50**

20N099 **Digital Electronics Projects for Beginners** *by Owen Bishop* Contains 12 digital electronics projects suitable for the beginner to build with the minimum of equipment. **$12.50**

AR2871 **W1FB's Help for New Hams** *by Doug DeMaw W1FB* Complete for the newcomer. Put together a station and get on the air. **$10.00**

AR2286 **First Steps in Radio** *by Doug DeMaw W1FB* Series of *QST* articles. **$5.00**

SHORTWAVE

06S57 **1993 Passport to World Band Radio** *by International Broadcasting Services, Ltd* You'll get the latest station and time grids. **$16.50**

03S11 **Shortwave Receivers Past and Present** *edited by Fred J. Osterman* Guide to 200+ shortwave receivers manufactured in the last 20 years. The Blue Book of shortwave radio value. **$8.95**

07R25 **The RTTY Listener** *by Fred Osterman* New and expanded. This specialized book compiles issues 1 through 25 of the *RTTY Listener Newsletter*. Contains up-to-date. hard-to-find information on advanced RTTY and FAX monitoring techniques and frequencies. **$19.95**

03C09 **Shortwave Clandestine Confidential** *by Gerry L. Dexter* Covers all clandestine broadcasting, country-by-country: tells frequencies, other unpublished information: spy, insurgents, freedom fighters, rebel, anarchist radio, secret radio. **$8.50**

03M221 **US Military Communications (Part 1)** US Military communication channels on shortwave. Covers frequencies, background on point-to-point frequencies for the Philippines, Japan and Korea, Indian and Pacific Oceans, and more. **$12.95**

03M222 **US Military Communications (Part2)** Covers US Coast Guard, NASA. CAP. FAA. Dept. of Energy, Federal Emergency Management Agency, Disaster Communications, FCC, Dept. of Justice. From 14 KC to 9073 KC. **$12.95**

03M223 **US Military Communications (Part 3)** Completes the vast overall frequency list of US Military services, from 8993 KC to 27,944 KC. **$12.95**

09S42 **The Scanner Listener's Handbook** *by Edward Soomre N2BFF* Get the most out of your scanner radio. **$14.95**

11T88 **Tune in on Telephone Calls** *by Tom Kneitel K2AES* Formatted as a frequency list with detailed description of each service and its location in RF spectrum. **$12.95**

03K205 **Guide to Radioteletype (RTTY) Stations** *by J. Klingenfuss* Updated book covers all RTTY stations from 3MHz-30MHz. Press, Military, Commercial, Meteo. PTTs. embassies, and more. **$12.95**

11AS10 **Air Scan Guide to Aeronautical Communications (5th Ed.)** *by Tom Kneitel K2AES* Most comprehensive guide to monitoring US aeronautical communications. Covers all Canadian land airports and seaplane bases, plus listings for Central America, the Caribbean, North Atlantic, and the Pacific Territories. **$14.95**

15A002 **Scanner and Shortwave Answer Book** *by Bob Grove* Most frequently asked questions by hobbyists. **$13.95**

07A66 **Aeronautical Communications Handbook** *by Robert E. Evans* Exhaustive, scholarly treatment of shortwave aeronautical listening. **$19.95**

11RF13 **The "Top Secret" Registry of US Government Radio Frequencies (7th Ed.)** *by Tom Kneitel K2AES* This scanner directory has become the standard reference source for frequency and other important information relating to the communications of federal agencies. **$19.95**

11F52 **Ferrell's Confidential Frequency List, New Revised Edition** *compiled by A.G. Halligey* All frequencies from 4 MHz-28MHz covering ship, embassy, areo, Volmet, Interpol, numbers, Air Force One/Two, more. **$19.50**

11SR97 **National Directory of Survival Radio Frequencies** *by Tom Kneitel K2AES* Handy and concise reference guide to high interest communications frequencies required by survivalists. **$8.95**

11SM11 **Scanner Modification Handbook, Vol. 1** *by Bill Creek* provides straightforward step-by-step instructions for expanding the operating capabilities of VHF scanners. **$17.95**

11EE06 **Guide to Embassy Espionage Communications** *by Tom Kneitel K2AES* Candid and probing examination of worldwide embassy and (alleged) espionage communications systems and networks. **$10.95**

20N094 **A Flick of the Switch, 1930-1950** *by Morgan E. McMahon* Discover the fast-growing hobby of radio collecting. **$8.95**

07R26 **World Wide Aeronautical Communications** *by Robert E. Evans* Aircraft/Air Traffic Control. Aircraft/Company Operations, Aviation Weather Broadcasts, Aeronautical Flight Tests, Worldwide Military Air Forces, Aero Search & Rescue. Aero Law Enforcement. NASA Flight Support, Aero Terms & Abbreviations and Aero Tactical Identifiers. **$6.95**

11T89 **Scanner Modification Handbook Vol. 2** *by Bill Creek* Here it is—a companion to Vol. I. In fact, Vol. 2 has a section that provides improved approaches and updated techniques for the mods in Vol. 1. There's 18 new exciting modifications for popular scanners. **$17.95**

03R01 **World Press Services Frequencies (RTTY) New 5th Ed** A comprehensive manual covering radioteletype news monitoring—contains all information—antenna. receiving, terminal units, plus three extensive frequency lists. **$8.95**

ARRL BOOKS

AR1994 **ARRL 1994 Handbook (71st Ed.)** Features: added DSP, improved treatment of Pi and Pi-L, all new all-digital-logic, plus lots more. **$25.00**

AR1993 **ARRL 1993 Handbook (70th Ed.)** 39 chapters, featuring 2,100 tables, figures and charts. Comprehensive, well organized and affordable. **$25.00**

AR1086-4 **ARRL Operating Manual (4th Ed.)** Information on how to make the best use of your station, including: interfacing home computers. OSCAR, VHF-UHF. **$18.00**

AR0194 **Antenna Compendium Vol. 1** Materials on verticals, quads, loops, yagis, reduced size antennas, baluns, Smith Charts, antenna polarization. **$10.00**

AR2545 **Antenna Compendium Vol. 2** Covers verticals, yagis, quads, multiband and broadband systems, antenna selection. **$12.00**

AR4017 **Antenna Compendium Vol. 3** More verticals, yagis, quads, plus loops, arrays. mobile, direction finding, controlled currents, computerized, installation, overloads, plus 40 new articles for beginner's to advanced. **$14.00**

AR2626 **Companion Software for Antenna Compendium Vol. 2** 5 1/4" MS-DOS floppy. **$10.00**

AR0488 **W1FB's Antenna Notebook** *by Doug DeMaw W1FB* Get the best performance out of unobtrusive wire antennas and verticals. Build tuners and SWR bridges. **$9.50**

AR0348 **QRP Notebook** *by Doug DeMaw W1FB* Presents construction projects for the QRP operator. **$9.50**

AR4141 **W1FB's Design Notebook** *by Doug DeMaw W1FB* Filled with simple practical projects that can be built using readily available components and common hand tools. **$10.00**

AR2200 **Antenna Impedance Matching** *by Wilfred N. Caron* Most comprehensive book written on using Smith Charts in solving impedance matching problems. **$20.00**

AR0402 **Solid State Design** Good, basic information, circuit designs and applications; descriptions of receivers, transmitters, power supplies, and test equipment. **$12.00**

AR3193 **Weather Satellite Handbook (4th Ed.)** *by Dr. Ralph Taggart WB8DQT* Expanded and revised to reflect today's weather-fax satellite technology. **$20.00**

AR3290 **Companion Software for Weather Satellite Handbook** 5 1/4" MS-DOS Floppy. **$10.00**

AR3291 **Now You're Talking! All You Need To Get Your First Ham Radio License (2nd Edition)** A complete study guide for the Technican and Novice written exam. Practical information every beginner needs is written clearly and simply and in small doses. **$19.00**

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AR0437 **ARRL Repeater Directory 1993-1994** 19,000+ listings with digipeaters, bandplans, CTCSS (PL(TM)) tone chart, frequency coordinators, ARRL special service clubs, and beacon listings from 14 MHz to 24GHz. **$6.00**

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AR2383	**General Class**	$6.00
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AR2083 **Complete DX'er (2nd Ed.)** *by Bob Locker W9KNI* Learn how to hunt DX and obtain hard-to-get QSL cards. **$12.00**

AR2065 **ARRL Antenna Book** The new 16th Edition represents the best and most highly regarded information on antenna fundamentals, transmission lines, design, and construction of wire antennas. **$20.00**

AR3293 **Morse Code: The Essential Language** *by L. Peter Carron Jr. W3DKV* Expanded and revised in its 2nd edition. How to handle distress calls heard not only on the hambands but on maritime and aircraft frequencies. **$6.00**

AR4114 **Low Profile Amateur Radio** For the Ham who lives where antennas are frowned upon. From hiding your antenna to operating with low power. This book tells you how to get on the air using these techniques—and others—without calling attention to yourself. **$8.00**

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REFERENCE

20N102 **Practical Digital Electronics Handbook** *by Mike Tooley BA* Contains nine digital test gear projects. Digital circuits, logic gates, bistables and timers, microprocessors. memory and input/output devices. **$14.50**

20N103 **Electronic Power Supply Handbook** *by Ian R. Sinclair* Covers many types of supplies—batteries, simple AC supplies. switch mode supplies and inverters. **$16.25**

20N104 **Electronic Test Equipment Handbook** *by Steve Money* A guide to electronic test equipment for the engineer, technician, student and home enthusiast. **$18.00**

20N105 **Digital Logic Gates and Flip-Flops** *by Ian R. Sinclair* A firm foundation in digital electronics. Treats the topics of gates and flip-flops thoroughly and from the beginning. **$18.00**

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09D22 **The World Ham Net Directory** *by Mike Witkowski* New—2nd edition. Introduces the special interest ham radio networks and shows you when and where you can tune them in. **$9.50**

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10F093 **1993 International Callbook** The new 1993 International Callbook lists 500,000+ licensed radio amateurs in the countries outside North America. It covers South America, Europe, Africa, Asia, and the Pacific area (exclusive of Hawaii and the U.S. possessions). **$29.95**

10D093 **1993 North American Callbook** The 1993 North American Callbook lists the calls, names, and address information for 500,000+ licensed radio amateurs in all countries of North America. **$29.95**

05H24 **Radio Handbook, 23rd Ed.** *by William I. Orr W6SAI* 840 pages of everything you wanted to know about radio communication. **$39.95**

02B10 **Heath Nostalgia** *by Terry Perdue K8TP* 124 page illustrated history of the Heath Company. Includes many fond memories contributed by long-time Heathkit employees. **$9.50**

10DF92 **1993 Callbook Supplement** An update to the 1992 International and American callbooks. **$10.00**

12E76 **Basic Electronics** *Prepared by the Bureau of Naval Personnel* Covers the important aspects of applied electronics and electronics communications. **$10.95**

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20N091 **Most-Often-Needed Radio Diagrams and Servicing Information, 1926-1938, Volume One** *compiled by M.N. Beitman* An invaluable reference for anyone involved in Vintage Radio restoration. **$11.95**

20N096 **How To Read Schematics (4th Ed.)** *by Donald E. Herrington* Written for the beginner in electronics, but it also contains information valuable to the hobbyist and engineering technician. **$14.95**

20N097 **Radio Operator's World Atlas** *by Walt Stinson, W0CP* This is a compact (5x7), detailed, and comprehensive world atlas designed to be a constant desk top companion for radio operators. **$17.95**

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WAYNE'S PICKS

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01P22-2 **The Packet Radio Handbook (2nd Ed.)** *by Jonathan L. Mayo KR3T* "...the definitive guide to amateur packet operation."—Gwyn Reedy W1BEL **Only $16.95**

09V11 **The Basic Guide to VHF/UHF Ham Radio** *by Edward M. Noll* Provides a first rate introduction to the 2.6 and 1.25 meter bands as well as 23, 33, and 70cm. **$6.50**

20N019 **U.S. Repeater Mapbook** *by Robert Martin* The Guide for traveling radio amateurs. **$9.95**

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20N108 **The Easy Wire Antenna Handbook** *by Dave Ingram K4TWJ.* Gives you all of the needed dimensions for a full range of easy to build and erect "sky wires." **$9.50**

01A70 **Practical Antenna Handbook** *by Joseph J. Carr* Design, build, modify, and install your own antennas. **$22.95**

10A342 **All About Verticle Antennas** *by William Orr* Comprehensive coverage of amateur communications. **$10.95**

10A343 **All About Cubical Quad Antennas** *by William Orr and Stuart Cowan* "The Classic" on Quad design, theory, construction, operation. New feed and matching systems. New data. **$11.95**

10A345 **Beam Antenna Handbook** *by William Orr and Stuart Cowan* Everything you need to know about beam design, construction, and operation. **$11.95**

10A346 **Simple, Low-Cost Wire Antennas For Radio Amateurs** *by William Orr and Stuart Cowan* All New! Low-cost, multi-band antennas; inexpensive beams, "Invisible" antennas for hams in "tough" locations! New data. **$11.95**

SOFTWARE

04M54 **GGTE Morse Tutor** From beginner to Extra class in easy self-paced lessons. Code speeds from 1 to over 100 words per minute. Standard or Farnsworth mode. Adjustable tone frequency. Create your own drills, practice or actual exams. Exams conform to FCC requirements. 5 1/4" floppy for IBM PC, XT, AT, PS/2 or compatibles. **$19.50**

04M55 **Advanced Edition** **$29.95**

20N021 **No Code Ham Radio Education Package** Computer software package. Includes computer aided instruction software (IBM compatible), 200 page Ham Radio Handbook. **$28.95**

20N022 **Ham Operator Education Package** Computer software contains five IBM compatible discs with all questions for all license classes, plus "Morse Academy" code teaching software that takes you from 0-20 wpm. **$28.95**

Lanze Code Programs—(Available on 5 1/4" disk.) Inexpensive complete study guide code programs for both the C64/128 Commodores and the IBM compatibles. Programs include updated FCC questions, multiple choice answers, formulas, schematic symbols, diagrams, and simulated (VE) sample test.

	IBM Part#	Commodore Part#	Price
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Tech	IBM02	COM02	$14.95
General	IBM03	COM03	$14.95
Advance	IBM04	COM04	$19.95
Extra (New Pool)™	IBM05	COM05	$19.95

IBM06, COM06 IBM/Commodore Tech No Code—Lanze Code Program Contains all the authorized FCC questions and answers used in testing formulas, schematic symbols, diagrams, and sample test for passing the new Technician No Code license. **$24.95**

IBM97 **Amateur Radio Part 97 Rules** New Edition, complete FCC rules. **$9.00**

CODE TAPES

73T05 **"Genesis"** **$5.95**
5 wpm—This beginning tape, takes you through the 26 letters, 10 numbers, and necessary punctuation, complete with practice every step of the way.

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73T13 **"Back Breaker"** **$5.95**
13+ wpm—Code groups again, at a brisk 13+ wpm so you'll be really at ease when you sit down in front of a steely-eyed volunteer examiner who starts sending you plain language code at only 13 per.

73T20 **"Courageous"** **$5.95**
20+ wpm Congratulations! Okay, the challenge of code is what's gotten you this far, so don't quit now. Go for the extra class license. We send the code faster than 20 per.

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RF1293

new products

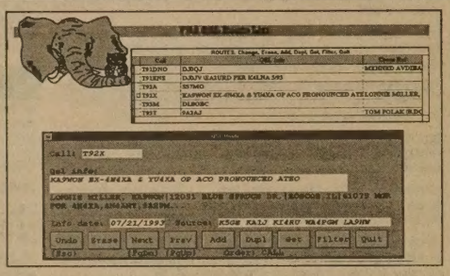
AZDEN CORPORATION

A new voice-quality headset has been announced by the Communications Division of Azden Corporation. The Model DM-10 has a special lightweight design and an audio frequency range particularly well suited for communications applications.

The adjustable headband provides a perfect fit for all sizes. The padded earpieces cover the ear so outside sounds are reduced but not eliminated. Low frequency noise, such as power supply hum, and high frequency interference, such as hiss and static, are significantly reduced.

The price is $49.95 factory direct. For more information contact *Azden Corporation, 147 New Hyde Park Road, Franklin Square, NY 11010; (516) 328-7500, FAX (516) 328-7506.* Or circle Reader Service No. 202.

PERSONAL DATABASE APPLICATIONS



The new PDA QSL Route Database is now available from Personal Database Applications. For only $10 LOGic users have long enjoyed the convenience of having thousands of QSL routes at their fingertips. Now PDA is offering this full-featured user-updadable list to all hams.

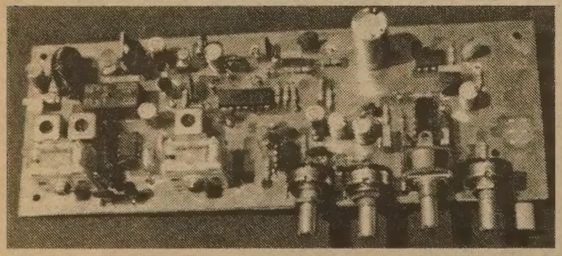
Data for the list has been compiled from information gathered by hams worldwide, who use LOGic to process their cards. The current list has 28,000 routes, with hundreds more being added each month.

The list includes DOS access software with full mouse support. The latest list is only $10, a one-year bimonthly subscription is $35, a one-year monthly subscription is $60. Software for Windows (3.1) is $10 extra. For more information contact *Personal Database Applications, Dept. DX, 2616 Meadow Ridge Dr., Duluth, GA 30136; (404) 417-1899.* Or circle Reader Service No. 203.

GORDON WEST

The Novice and Technician question pools, FCC Elements 2 and 3A, were revised in July 1993. One of the first updated books covering the new questions is the Gordon West *New No-Code* book, available through most ham radio dealers.

"What makes our book different from traditional theory guides is our question-and-answer format, along with my paragraph of description on why the answer is correct," says author Gordon West WB6NOA. "This allows students to prepare for their examination in the same exact order as the FCC syllabus." The new book contains more than just questions, answers, and descriptions. There are 50 pages guiding the new student through test-taking, preparing for the optional code test, filling out the FCC's Form 610, and locating nearby examiners. For discount classroom quantity prices call (800) 669-9594. For more information contact Gordon West, c/o W5YI, P.O. Box 56510, Dallas, TX 75356-5101; (714) 549-5000 *Or circle Reader Service No. 204.*



CURRY COMMUNICATIONS

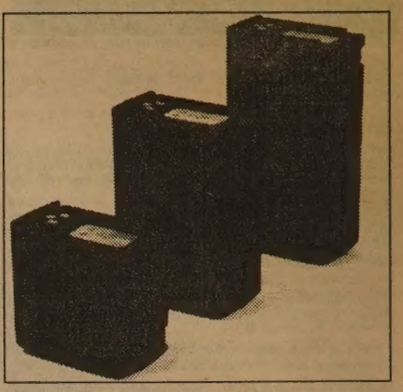
Curry Communications has introduced a professional-grade low-frequency CW transceiver kit. The Model CW893 brings the enjoyment of license-free low frequency communications to radio enthusiasts at a low price.

Many radio enthusiasts enjoy the 1750 meter band (160-190 kHz) for the technical challenge and the opportunity to contact other "LOWFERS" without the license requirement. An important benefit of this low frequency hobby is the training and skill a person receives which can help him earn a ham ticket. Many ham operators also like to play around with low frequency work because of the variety it can add to the hobby.

The CW893 has a sensitive direct conversion receiver. Special circuits effectively eliminate interference from strong local signals. Adjustable filters make it an ideal CW receiver. The transmitter section uses efficient MOSFET technology and is capable of 10 watts output (1 watt is the legal limit in the US).

The price for the complete kit is $89 ppd. For more information contact *Curry Communications, 737 North Fairview Street, Burbank, CA 91505; (818) 846-0617.* Please send an SASE for information. Or circle Reader Service No. 206.

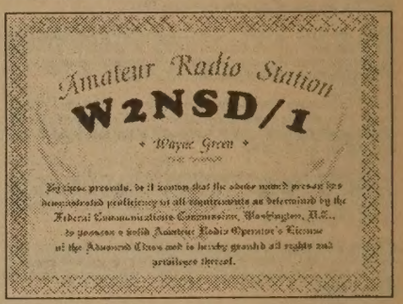
PERIPHEX INC.



Periphex announces longer operating, higher capacity, lower cost batteries for Yaesu's popular FT-26, 76, 415, 416, 815, 816, and 530 hand-held radios. The FNB-25 (7.2 volts, 700 mAh) and FNB-26S (7.2 volts, 1400 mAh) offer a 40% increase in operating time at low power; while the FNB-27S (12 volts, 800 mah) offers a 33% increase in operating time at 5 watts output. Both superpack batteries are priced at $65 and are 3.75 inches tall. The FNB-25 is priced at $39. The standard FNB-26 and FNB-27 (three inches tall) are also available for $60.

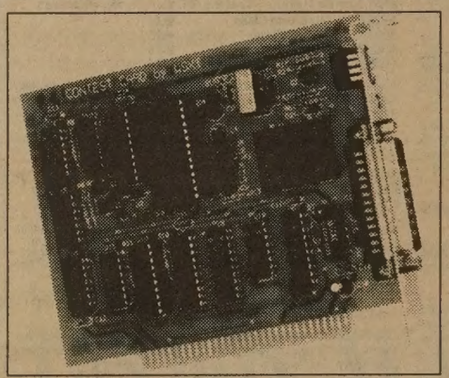
All battery packs include overcharge protection, over-temperature protection, short circuit protection, and a one-year warranty. They are completely compatible with appropriate Yaesu chargers and are immediately available from Periphex and its franchised dealers. For further information contact *Periphex, Inc., 115-1B Hurley Road, Oxford, CT 06478; (800) 634-8132 or (203) 264-3985.* Or circle Reader Service No. 201.

TRADER



Trader Printing has just hit the ham radio market with a new, great-looking station license certificate. This attractive, full-size (8-1/2" x 11") parchment certificate is offset printed in three colors and will brighten the walls of any ham shack. It is personalized with the station operator's name, callsign, and license class. It makes a great gift for any new ham you know, or for someone who has recently upgraded and would enjoy this visible reward for his or her accomplishment.

The certificate is mailed flat for $4.95 ppd. For more information contact *Trader, 4290 Bells Ferry Road, Suite 106-36, Kennesaw, GA 30144; (404) 908-7325.* Or circle Reader Service No. 205.

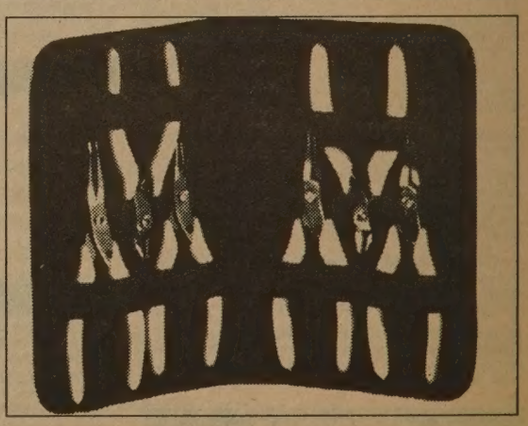


UNIFIED MICROSYSTEMS

Unified Microsystems announces the Contest Card, a PC plug-in interface board that contains a voice recorder/keyer and CW interface. This unit allows hams to record their CQs, callsigns, contest exchanges, and other voice messages for transmission under control of the computer. The Contest Card can be used with PC-based repeater controllers for ID, special voice messages, or other applications.

The Contest Card is available in kit form for $119.95 or assembled and tested for $179.95. (Please add $5 S&H in the US and Canada.) For more information please contact *Unified Microsystems, P.O. Box 133, Slinger, WI 53086; (414) 644-9036.* Or circle Reader Service No. 208.

RF INDUSTRIES



RF Industries, Ltd. has entered the hand and cable preparation tool market with the introduction of two highly competitive stainless steel hand-tool kits.

The RFA-4080 kit is comprised of six tools: one flush cutter, one "gripper nipper" cutter, one wire loop former, one long nose pliers, one duck bill pliers, and one offset bent nose pliers. All six are stainless steel with adjustable pivot and a rockwell hardness of 46-48. All contact surfaces are serrated.

The RFA-4081 is exactly as the above except that all contact surfaces are smooth.

Both come in zippered leatherette cases with elastic hold downs. For prices and other information contact *RF Industries Ltd., 7620 Miramar Road, San Diego, CA 92126; (800) 233-1728.* Or circle Reader Service No. 207.

"Built-in VOX? Right!"

"Dual Decode. Now that's a first!"

"Wow, a real Battery Voltage Readout!"

"Yaesu did it again!"

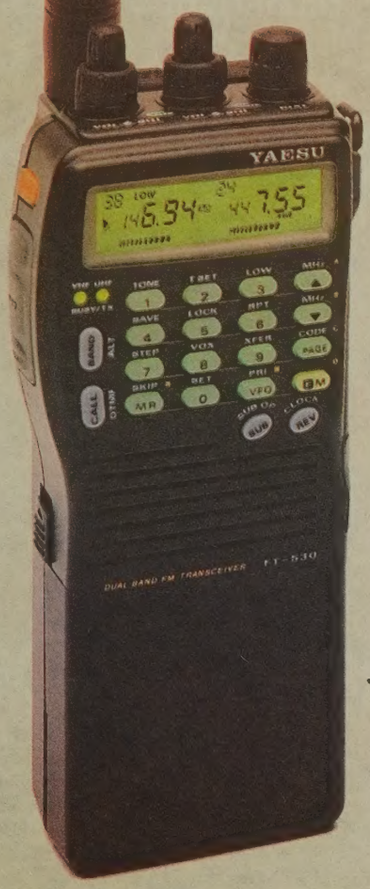
FEATURES	Yaesu FT-530	Kenwood TH-78A	Alinco DJ-580	Icom IC-W-21AT
Memory Channels	82	50	40	70
Slide-out Lithium Battery	YES	NO	NO	NO
Dual CTCSS Decoder	YES	NO	NO	NO
Battery Voltage Readout	YES	NO	NO	NO
Automatic CTCSS Tone Search	YES	NO	NO	NO
Transmit Battery Saver (Repeater & Simplex Operation)	YES	NO	NO	NO
Built-In Vox	YES	NO	NO	NO
One Touch Reverse Button	YES	NO	NO	NO
Dual In-Band Receive (V+V, U+U)	YES	YES	NO	YES
Programmable External Speaker Audio	YES	NO	NO	NO
Optional Digital Display Mic with "S" Meter	YES	NO	NO	NO
AM Aircraft Receive	YES	YES	YES	YES

The Best vs. "the rest".

FT-530
Dual Band Handheld

- **Frequency Coverage:**
  2-Meter 130-174 MHz RX
  144-148 MHz TX
  70 cm 430-450 MHz RX/TX
- 4 TX Power levels:
  w/FNB-25: 2.0, 1.5, 1.0, 0.5W
  w/FNB-27: 5.0, 3.0, 1.5, 0.5W
- DTMF Paging and Coded Squelch
- AOT – Auto On-Timer with built-in clock and alarm functions
- IBS – Intelligent Band Select (provides automatic TX band select on scan stop)
- Backlit keypad and display with time delay
- Built-in cross-band repeat function
- APO – Automatic Power Off
- 5 Watts output w/ FNB-27 battery or 12 VDC
- 2 VFO's for each band
- **Accessories:**

NC-42 1-Hour Desk Charger
FNB-25 600 mAh Battery (2 watt)
FNB-26 1000 mAh Battery (2 watt)
FNB-27 600 mAh Battery (5 watt)
FBA-12 6 AA Cell Holder
CSC-56 Vinyl Case w/ FNB-25
CSC-58 Vinyl Case w/ FNB-26/27
E-DC-5B 12 VDC Adaptor
YH-2 Headset for VOX
MH-12A2B Speaker Mic
MH-18A2B Lapel Speaker Mic
MH-19A2B Mini Earpiece Mic
MH-29A2B LCD Display Mic with Remote Functions
MMB-54 Mobile Mounting Hanger



No other dual band handheld beats the FT-530 on features for performance and ease of use. With the largest backlit keypad available, 82 memories, exclusive Dual CTCSS Decode and AM Aircraft Receive, the FT-530 is simply the best value there is.

Compare for yourself, then forget "the rest." See your dealer for the best dual band handheld you can buy. The FT-530.

YAESU

*Performance without compromise.*SM

Specifications subject to change without notice. Specifications guaranteed only within amateur bands. Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.

MEET THE NEWEST FACES IN TRANSCEIVER TECHNOLOGY

Small just got smaller. Kenwood's new TH-22AT (144MHz) and TH-42AT (440MHz) are in a category all their own, redefining "handheld communications" with a stylish palm-size format and equally impressive performance.

Besides being compact enough to slip into a shirt pocket, these two FM transceivers are light enough to carry everywhere. You'll be surprised by their output (over 5 watts with a 9.6V battery) and their stamina (long hours between charges). The secret lies in Kenwood's sophisticated power management system, featuring a MOS FET power module — a world first in this class — which enables reliable, low-voltage operation. Audio output is also great, thanks to the large built-in speaker.

Other welcome features are the built-in DTMF keypad, user-friendly menu system, multiple scan functions (VFO, call and memory) and scan stop modes (CO and TO), selectable squelch configuration, and tone alert with elapsed time indicator. In addition, there are 40 memory channels (plus 1 call channel) — all capable of storing transmit and receive frequencies, frequency step, tone (CTCSS) frequency, tone on/off status, CTCSS on/off status, DTSS code, DTSS on/off status, shift, and reverse on/off status in non-volatile E^2PROM (no battery backup required). And among the desirable options are a CTCSS decoder and rapid charger.

Kenwood's TH-22AT and TH-42AT — two transceivers that are too exciting to keep under your hat.

Hats Off!

TH-22AT/42AT

FM HANDHELD TRANSCEIVERS

TH-22AT APPROX
3.0 WATTS
TH-42AT APPROX
2.5 WATTS
WITH SUPPLIED
BATTERY

KENWOOD

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